This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
2 45 0416 8536

LANE

MEDICAL LIBRARY

SEAL OF THE LELAND STANFORD JUNIOR UNIVERSITY
1885

LEVI COOPER LANE FUND

THE NEW SYDENHAM SOCIETY.

INSTITUTED MDCCCLVIII.

VOLUME CXXXIX.

LECTURES

ON

DISEASES OF THE DIGESTIVE ORGANS.

BY

DR. C. A. EWALD,

EXTRA-ORDINARY PROFESSOR IN THE UNIVERSITY AND PHYSICIAN TO THE AUGUSTA HOSPITAL, BERLIN.

Translated from the latest German Edition

BY

ROBERT SAUNDBY, M.D. EDIN., F.R.C.P. LOND.,

Physician to the General Hospital, Birmingham.

VOL. II.

LECTURES ON DISEASES OF THE STOMACH.

London:

THE NEW SYDENHAM SOCIETY.

MDCCCXCII.

LONDON
Printed by Jas. Truscott & Son,
Suffolk Lane, [illegible]

~~5982
4.X.38
1892~~

PART II.

59960

LECTURES ON THE DISEASES OF THE STOMACH.

◆

LECTURE I.

METHODS—ESTIMATION OF THE ACIDITY AND ACIDS IN THE CONTENTS OF THE STOMACH.

GENTLEMEN,—If, in the following lectures, I undertake to discuss the *diseases of the digestive apparatus*, I must lay down certain limitations and forbear to deal with all aspects of the subject. Were I to treat of everything which belongs to the wide range of maladies of the digestive tract and its appendages, the scope of these lectures would become too wide, and each special subject would suffer for want of time. The diseases of the oral cavity, of the œsophagus, and of such organs as the liver and spleen, which stand in close relation through the portal vein to the intestinal tract, but which do not possess solely and exclusively digestive functions, will be only considered in so far as they directly affect the functions of the stomach and intestine, and their normal or abnormal condition cannot be separated from them. We shall principally confine ourselves to the diseases of the stomach and intestine, following in this the universal custom by which, although incorrectly, only the diseases of the last-named organs are spoken of as disorders of digestion.

But, gentlemen, in these lectures you will not get symmetrically arranged and sharply defined descriptions of the text-book kind. We can name with pride many works of this sort in our literature, handling special subjects, which have in their time admirably fulfilled their purpose. In the following lectures I shall depart from the style of a text-book not only in form but in substance. A text-book brings pathological processes into a definite system, classifies them in nosological order, and out of the aggregate of particular observations and facts depicts the classical outline of special types of disease. We shall adopt a closer, may I say a more intimate point of view. We shall employ our material for constructing general outlines of disease, but we shall, as far as possible, keep to definite personally observed characteristic cases, and especially to those which best illustrate those points on which I wish to give you my personal views.

Such personal views are, it need hardly be said, the result not only of my own experience but of my reading and study, and if in the course of these lectures I do not always quote every authority, it is because I do not wish to over-load my text with superfluous literary lumber, as in the present day it is so easy to do. At the same time you will find little of value omitted.

I believe, gentlemen, that your object in attending these lectures, intended for physicians already in practice, is to make an exhaustive use of the personal experience of the lecturer, and to do so all the more thoroughly that you are in a position to criticise them by the light of your own experience, and to exercise a riper and more critical judgment than is possible in the case of first year's men. I hope I may succeed, therefore, in placing before you what you already know as well as what is new to you in an acceptable shape.

The diagnosis of diseases of the stomach is based upon the subjective symptoms of the patient and the objective signs of the disease. Passing over the former, which I shall have to consider in connection with special disorders, we have for the latter the so-called *physical method*, including inspection, palpation, percussion, auscultation, and mensuration, as well as the analysis of the chemical functions, the absorption and movement of the organ, in a word, the investigation of the digestive function of the stomach as a whole.

These physical methods are so well known that they need only be referred to summarily. The examination of the functions of the stomach must take the first place in our discussion of general diagnosis. Although, according to our programme, we have to consider the pathology of the stomach, we must admit that we can recognise and discuss departures from the normal only by an intimate acquaintance with normal conditions, so that we must deal briefly with this aspect of the question. Whereas formerly we were confined to external signs and subjective symptoms, since we have learnt how easily and quickly to obtain portions of the stomach contents for examination, a great step in advance has been made in the diagnosis of diseases of the stomach. This is done by means of the stomach tube, and with the general employment of this instrument a new era has commenced in the pathology of these diseases.

Gentlemen, before entering upon a special description of our subject permit me to make a few remarks. The methods which have been lately employed for the improvement of our knowledge of the chemical processes taking place in the stomach have thrown as much light on the pathology of dyspepsia and irregularities of digestion, as, if I may compare small things with great, the ophthalmoscope has done for the retina, or the laryngoscope for the interior of the larynx.

It cannot be denied that this process has met with quick and widespread approbation, and that both clinicians and practitioners have made great use of it.

Perhaps I may be allowed to warn you not to hope too much from it for purposes of special practice. You will learn in the course of these lectures that the methods employed in the investigation of gastric digestion, after they have been once discovered, are so simple that any practitioner can perform them who has learnt when a student to triturate, to test acid and alkaline fluids, and to put a glass vessel in a warm chamber. In consequence there is none of that manual skill required which affords the basis for specialism. To obtain and examine the contents of the stomach is a task within the knowledge and capacity of every medical practitioner. There will, of course, be some who will be consulted on diseases of the stomach because they have paid great attention to them and possess special experience. But this alone is not sufficient. Therefore in order to gain the confidence of the profession and the public, it is necessary to cultivate not only special but general medical knowledge, and it is to be hoped that no one, as soon as he has passed his state examination, will hang out a sign with "Specialist for Diseases of Stomach" written upon it. You will learn in the course of these lectures how much diseases of the stomach are combined with those of other organs, how numerous are the points of connection, how often the signs are deceptive, how often in apparent stomach disorders quite other organs are really suffering, so that I am persuaded that it is not possible to confine the treatment of diseases of the stomach to a limited and special craft. I make these remarks because several inquiries on the subject have been addressed to me.

It is noteworthy that the employment of the stomach tube is by no means a recent invention.* We may pass over the rough manipulations of Fabricius ab Aquapendente, and Rumsæus (1659), who invented a "stomach brush," to remove the mucus from the stomach, "so that in those times there was not a Beer Drinking Association (Biercompagnie) of which some members did not use it in the evening when they had drunk too much; or else when, next morning, after lying intoxicated with open mouths, they were inconvenienced by the accumulation of mucus in their throats."†

It was John Hunter, in the second half of the last century, who introduced hollow sounds for the purpose of injecting stimulating substances into the stomach, while the English surgeon F. Bush, in 1822, first employed a stomach tube connected with a pump to empty the stomach in a case of opium poisoning, an invention which by others is ascribed to Weiss the instrument maker. The stomach syphon was first employed by Arnott‡ in 1829, and then by Somerville, but it fell into oblivion, and we have to thank the publication of Kussmaul's papers on the treatment of dilatation of the stomach, in 1867 and 1869,§ for restoring the stomach tube to medical practice. Its use had been recommended meanwhile, for example by Blatin, in 1832, and by Canstatt,‖ and was here and there employed. It was a valid though only privately asserted claim to priority which was made by Frerichs' clinic, that the pump was regularly in use there long before Kussmaul's publications.

---

* Leube. Die Magensonde. Die Geschichte ihrer Entstehung und ihrer Bedeutung in diagnostischer und therapeutischer Hinsicht. Erlangen, 1879.

† J. Chr. Kundmann. Seltenheiten der Natur und Kunst, &c. 1737.

‡ Quoted by Alderson. On the danger attending the use of the stomach pump. Lancet, January, 1879.

§ Kussmaul, in the 41st Versammlung deutscher Naturforscher und Aerzte zu Frankfurt a. M. 1867, and "Ueber die Behandlung der Magenerweiterung durch eine neue Methode mittelst der Magenpumpe." Deutsch. Arch. f. klin. Med. Bd. vi. p. 455.

‖ Canstatt in his Jahresbericht for 1841.

But in scientific matters priority is decided by the date at which the matter in question is first made public, and in that Kussmaul's services cannot be denied, as he first brought definitely under the notice of the medical public the employment and uses of the stomach tube.

At the Congress of Naturalists at Rostock, in 1871, Leube discussed the possibility of employing the tube for diagnostic purposes, and thereby opened out, as the sequel showed, a splendid field of investigation. But Leube in his first experiments had employed, like his predecessors, a hard tube, or an india-rubber tube with a whalebone style, a practice beset with difficulties and dangers. On the other hand, I first made it known that it is quite easy to introduce into the stomach a soft tube without any style, if its wall is of a certain thickness and possesses the requisite degree of rigidity. Accident at first, as it so often does, led to this discovery. In 1875, a man was admitted to Frerichs' wards, suffering from hydrocyanic acid poisoning, and it was necessary to wash out his stomach. We had none of the ordinary stiff tubes at hand, and so I cut off a piece of gas tubing, rounded the end, cut two eyelets in it, oiled the tube, and passed it easily into the stomach, in spite of the patient being unconscious. Later on, Oser published a similar experience, and the use of specially prepared tubes, made of smooth india-rubber, is now generally adopted. In France, since 1880, similar tubes have been used under the name of "Tubes Faucher."

The expressions œsophageal tube and œsophageal sound, as well as stomach sound, syphon sound, stomach tube, stomach pump, &c., are used by authors in a very arbitrary and often meaningless fashion. Sounds are distinctly solid bodies, not hollow instruments, and by their rigidity permit the sense of touch to be employed for deep examinations. To some extent hollow tubes may be used as sounds, if the rigidity of their walls is sufficient, as, for example, a catheter may be used to sound the bladder. In the same way the stiff œsophageal tubes and stomach tubes may be used for tactile exploration of the stomach and œsophagus. But on account of the purpose for which they are commonly used, they are naturally to be regarded chiefly as "tubes," in opposition to the solid unbored sounds. It is a mistake to speak, as Leube does, for example, of a syphon sound instead of a stomach tube or simply of a stomach syphon. I shall speak of all solid instruments as "sounds," of all hollow tubes, with stiff walls, as "œsophageal" or "stomach pipes," and of all of soft material (india-rubber or silk) as "stomach tubes."

It is obvious that when we introduce a tube with the intention of emptying the stomach, the contents will be withdrawn with ease in proportion to the size of the opening in the lower end of the tube. The common hard stomach pipe and the soft stomach tube in ordinary use have one or two openings called eyelets or fenestræ, near the lower end, and a rounded closed point made of some hard substance, in which, unless we are very careful, organic material collects and decomposes. I have the lower end of the tube, which can be made of different size or thickness, so that the lower part may be open, and following Schütz, instead of one large side opening (fenestra), as far down as possible I have a series of little holes each the size of a pin's head (fig. 1).

Thus the contents of the stomach can penetrate the tube on all sides and can be removed with ease.

Latterly, tubes made of woven silk with a coating of varnish have been offered for sale. They are somewhat stiffer than the india-rubber tubes, but much less so than the œsophageal pipes, and have been made under my directions after the pattern of the former. It is obvious that the more flexible the instrument introduced into the stomach, the less danger there is of any injury to the mucous membrane, an accident to which one is always liable, and which has actually happened with the use of stiff tubes. The stomach tube possesses another advantage over the stiff œsophageal pipe, inasmuch as it can be introduced, as I will presently show you, without the necessity for putting the finger in the patient's mouth, thus saving the patient the unpleasant sensation of being choked and the operator the possibility of a bitten finger. Under certain conditions it may be impossible to introduce a soft tube into a healthy œsophagus when—not to mention the cases of active resistance which may occur with patients of unsound mind—there are

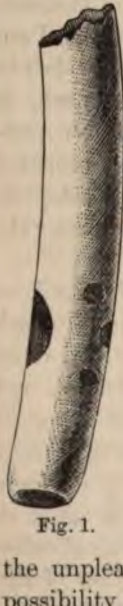


Fig. 1.

mechanical hindrances; for instance, an unusual narrowness of the œsophageal opening caused by a process of bone, or if the hyoid bone projects strongly backwards, or where there is nervous spasm of the œsophagus. In such cases it is necessary to use a stiffer tube, either the above-mentioned silk tube, or the so-called red English œsophageal tube made of varnished catgut, according to the amount of resistance which has to be overcome. I have discarded the black French sounds formerly so much in use, as I find that they do not wear well.

The above-mentioned instruments are all as a rule about 30 inches long, so that when they have been passed into the stomach, counting the normal length from the incisor teeth to the fundus ventriculi as about 24 to 26 inches, only a short piece projects beyond the teeth. If any of these instruments require to be lengthened for purposes of further manipulation, this may be done in the following manner: the india-rubber stomach tube either before or after its introduction can be connected by means of a glass tube with another india-rubber tube of any length required. The silk tube is stiff enough to allow an india-rubber tube to be fastened to it without the agency of a glass tube, while in the case of the œsophageal or stomach pipe a tap of hard india-rubber, furnished on the one side with a conical screw, can be twisted into the funnel-shaped enlarged upper end, while an india-rubber tube is drawn at the same time over the other side. India-rubber stomach tubes more than a yard long have also been made under my directions for use in cases of dilatation of the stomach.

In the use of any hard, more or less stiff instruments—such as probangs, œsophageal sounds, stomach sounds, stomach tubes, &c.—which are to be passed into the œsophagus or stomach, it is best to press down the tongue with the first finger of the left hand, inserted, if possible, as far as the epiglottis; then, holding the instrument as you would a pen, pass it quickly till you reach the posterior wall of the pharynx, then raise the wrist and project the point of the instrument down into the œsophagus. The more quickly and confidently you manipulate the better for both patient and operator. In my opinion, there is no fear whatever that the instrument will enter the air passages, and the elaborate discussions on this point which are to be found in some text-books seem to me unnecessary. Under ordinary circumstances, the epiglottis shuts the entrance to the larynx at once; but even in cases of paralysis or loss of sensibility of the parts about the glottis, or under any condition which might lead to an imperfection in the functions of the epiglottis, it would be an almost incredible act of clumsiness to pass the sound into the larynx instead of into the œsophagus. If this, however, should happen—"doctors" have been known to extract half the intestines through a ruptured uterus—the quick breathing, threatening suffocation and cyanosis of the patient—the air would stream in and out through a stiff œsophageal tube—would show at once that a "mistake" had occurred. Many patients who are not accustomed to the use of the sound become at once very cyanosed because they think that they cannot breathe, and therefore hold their breath convulsively. But we must not be misled by cases of this kind, as they are easily distinguished from the struggles for breath of a suffocating person, and can be dealt with by inducing the patient to breathe, or count in regular, measured time.

When the stomach tube is to be introduced it is not necessary, as Oser has already pointed out, either to oil its outer surface or to rub it with vaseline or glycerine. It should be simply dipped in warm water, as the saliva of the patient will lubricate it sufficiently. Ask the patient to open his mouth, push the tube, which is sufficiently stiff to allow of your doing so, as far back as the posterior wall of the pharynx, and then cause the patient to swallow; the tube, caught by the muscles of deglutition, will then slide without difficulty over the œsophageal opening, which can be easily felt, and, once in the upper part of the œsophagus, by gentle pressure it can be passed quickly into the stomach. In some cases you will feel a certain amount of resistance at the cardia, but this is not usual. By manipulating in this manner you will avoid the unpleasantness, both for operator and patient, of putting your finger into the patient's mouth. The whole proceeding is quite simple, and so little trying in any way that among the numerous patients whom I have examined in the last few years it has seldom happened that I have not been able to pass the tube. With a certain amount of patience on one part, and decision on the other, it can be done even with the most nervous and timid patients, and I consider the behaviour of the patient during this operation to be an excellent test of the state of his nervous system, and, as the ancients say, of his sanguine or lymphatic temperament. In the case of a highly sensitive person, you can ensure the entire absence of local irritation by painting the posterior pharyngeal wall some minutes before the introduction of the tube with 10 to 20 per cent. cocaine solution, but I have hardly ever found it necessary to do so. I venture to maintain that even without the aid of cocaine the introduction of the tube is far less unpleasant to the patient than an examination, under cocaine, with the laryngoscope, which occasions at first a great feeling of irritation.

When the tube is once introduced, the next thing is to bring up the contents of the stomach. Here, too, in the last few years, we have made great progress in the simplification of the methods employed. Originally a stomach pump was made use of, the double action of which enabled the contents of the stomach to be drawn up on one side, and then by reversing the piston, or by means of another valve-like apparatus, emptied on the other. Other still more complicated methods of suction were employed which, according to the old saying, "made five quarters to a mile." Jaworski's so-called "stomach aspirator" is one of these, a complicated and useless contrivance, which is made on the same principle and is no more use than an ordinary syringe, but which requires such an apparatus of glass tubes and bottles that it is utterly unfit for practical purposes. A good and simple method of obtaining the contents of the stomach is to fasten to the tube which has been already introduced an india-rubber tube provided with a large pear-shaped ball, like the well-known Politzerising apparatus, at the lower end. If the ball is pressed together before being fixed on to the india-rubber tube, as it distends itself the contents of the stomach will, so long as they remain under the ordinary influence of atmospheric pressure, be sucked up into it. By reversing the action any remains of food which may obstruct the passage through the tube may be ejected back from it into the stomach by the process of filling the ball with air or water, fastening it to the tube and pressing it gently till the resisting matter has been removed. Dr. Boas has suggested the use of a ball open at both ends, which may be employed sometimes in one direction, sometimes in another, for aspirating and evacuating into a vessel held below it.* But in ordinary cases all this manipulation is not required.

Some time ago, in conjunction with Dr. Boas, I was enabled to prove that the contents of the stomach may be procured at any time by the use of abdominal pressure, active expression by the patient sufficing to push the contents of the stomach into the tube, provided only that these are sufficiently fluid not to cause any stoppage in the lumen of the tube.† This method has since been tried "with the best results," and is known under the name of Ewald's "method of expression." It may have been noticed before in isolated cases that in coughing, &c., the contents of the stomach were occasionally pressed out through the tube, but the merit of having invented the method, and thereby to a great extent simplified our mode of treatment, may be claimed by Boas and myself with the greater confidence, as only by the use of the soft tube and this method of expression can the investigations reach the standard demanded of every good method, to work safely, quickly, and, as far as possible, pleasantly, which is certainly not a question of little moment, but one of vital importance. This method should, however, always be avoided in cases where there is danger of rupture of an aneurysm, brittle vessels, &c., on account of the somewhat violent contraction of the muscles of the abdomen which it entails. But such cases, one of which I have communicated to the Berlin Medical Society (reprinted in Berl. klin. Wochenschrift of July 28th, 1890), are the exception, and may be avoided by the use of proper precautions, or must be looked upon as the unfortunate and inevitable complications which may arise in the routine application of any method in medical practice. It is a safe rule to avoid this method in any case in which force has to be used for expression, and to have recourse to aspiration as soon as the outflow ceases to be smooth and easy.

In answer to the remark lately made by Dr. Allbutt‡ on washing out the stomach—"This troublesome and disgusting operation is so repulsive to the better class of patients, that the physician is tempted to stop too soon and lay down the tube"—I should recommend him to make use of the methods above described, which will, I feel sure, produce happier results. I could at any rate quote cases of patients belonging to the first ranks of society who have made no objection whatever to the introduction of the tube and the washing out of the stomach, and I consider it so indispensable and necessary for purposes of diagnosis, that I should not consider that I was doing my duty if I omitted it in any doubtful case.

---

* F. Boas. Allgemeine Diagnostic und Therapie der Magenkrankheiten. Leipzig, 1890, p. 106.

† Ewald and Boas. Beiträge zur Physiologie und Pathologie der Verdaunng. Virchow's Archiv. Bd. ci. p. 325-375, and Bd. civ. p. 271-305.

‡ C. Allbutt. On simple dilatation of the stomach or gastroectasis. Lancet, Nov. 5, 1887.

Epstein* even recommends the use of proportionally small stomach tubes, *i.e.*, Nélaton's catheters, Nos. 8, 9, and 10, for very small children or infants, and Leo† has made use of these instruments for the purposes of methodical investigation of the functions of the stomach in such cases.

It may, however, happen that, although the stomach is full, none of the above-mentioned methods succeed in bringing up its contents. In such cases either the opening of the tube is against the mucous membrane or its eyelets are obstructed—such accidents occur very rarely if my method of procedure is followed—or the tube has been passed too far, and, following the course of the great curvature, has taken a bend, so that its end projects above the contents of the stomach, as the accompanying illustration (fig. 2) will show. In this case it is only necessary to draw it back a little to produce the desired result.

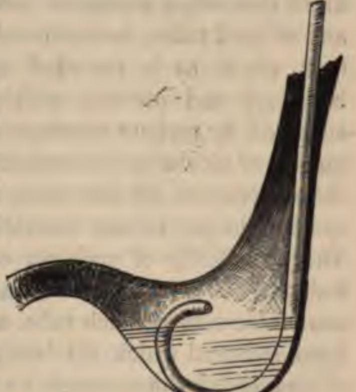


Fig. 2.

It happens occasionally, in rarer cases, that the stomach is empty at the time after eating the test breakfast, at which, under normal conditions, it ought to be still full, so that nothing can be taken out of it. This is the result of an abnormally quick passage of the ingesta into the intestine, a condition which I shall discuss later, when I come to speak of the neuroses of the stomach.

---

* Epstein. Ueber Magenausspülung bei Säuglingen. Arch. für Kinderheilk. 1883, Bd. iv. p. 325.

† Leo. Ueber die Function des normalen und kranken Magens, &c., im Säuglingsalter. Berl. klin. Wochenschr. 1883, No. 49.

Gentlemen, I will now show you on a female patient how easily this method of expression, as we have called it, fulfils its purpose (demonstration). Although in this instance the result is so speedy and effectual, I must not conceal from you the fact that in isolated cases expression does not produce the desired result. For instance, when the abdominal wall is so relaxed that abdominal pressure cannot be applied; and, again, in cases where the patient has no control over his muscles, and is unable to press when desired to do so, or perhaps makes convulsive efforts to cough. It may happen that this method of expression fails on first or second trial, or possibly altogether, but taken all in all, this hardly occurs in five per cent. of the cases in which it is employed.

I appeal to you, gentlemen, are the methods of sounding and washing out the stomach above described dangerous? You know that when exclusive use was made of the stomach pump and of hard tubes, laceration of the mucous membrane frequently took place, as is recorded by Wiesner,* Ziemssen,† Leube,‡ Schliep,§ and others; which laceration, however, was never attended by serious consequences, such as bleeding or the formation of ulcers in the stomach. This may be accounted for by the contraction of the walls of the stomach, which causes the speedy closing of any laceration which may have taken place. The probability of such an occurrence, or even of any violent lesion of the mucous membrane, is reduced to a minimum by the use of the soft stomach tube, and thus a very real objection has been removed which till lately was urged against the practice of examining the stomach on account of the danger in certain conditions, such as ulcer or cancer, which bleed easily. An unpleasant complication, which might at times lead to symptoms of suffocation, pneumonia from inhaled food, &c.,‖ is the regurgitation or vomiting of food while the tube is still in the stomach. With highly sensitive persons this can be obviated either by painting with cocaine, or by causing the patient to swallow a small dose of it; if the operation of introducing the tube is performed after the test breakfast (see below), the regurgitation (which of course depends on the quantity of food which has been taken) will be but slight, or only a little scarcely offensive matter will be ejected. It can almost always be cured by pouring a little water into the stomach, and thus removing the irritation caused by the action of the tube on the walls of the stomach.

---

* Wiesner. Ueber die Behandlung der Ectasie mittelst der Magenpumpe. Berl. klin. Wochenschr. 1870, No. 1, p. 3.

† v. Ziemssen. Zur Technik der Localbehandlung des Magens. D. Arch. f. klin. Med. Bd. x. p. 66.

‡ Leube. Die Magensonde. Erlangen, 1879, p. 25.

§ Schliep. On the stomach pump in the treatment of chronic gastric catarrh and dilatation. Lancet, Dec. 14, 1872.

‖ Emminghaus. Einiges über Diagnostik und Therapie mit der Schlundsonde. Deutsch. Arch. f. kl. Med. Bd. xi. p. 304.

In the course of my experience I have, with one exception (see above, p. 226), never witnessed any dangerous symptoms either of excessive bleeding or of any other kind; and I can endorse the opinion of Leube* that sounding the stomach is never a dangerous operation; instead, however, of saying "never," I should prefer to add "if undertaken with sufficient care."

I need not tell you, gentlemen, that in examining the contents of the stomach it is necessary to secure, as far as possible, uniformity of conditions. The activity of secretion in the stomach varies according to the material with which it is supplied. The stomach secretes copiously when it has full opportunity to exercise its functions, and secretes little when the calls made upon it are few. A large meal, until it is saturated with the products of glandular activity, makes far larger demands on the secretive function of the glands than a small one. Therefore examinations of the contents of the stomach, made at different times in the day, and after different food has been taken, will yield very different results. This fact, which has not been sufficiently considered, accounts for the numerous discrepancies which till lately were to be found in different works on the subject, and it is therefore imperatively necessary that the various examinations, if they are to give results useful and trustworthy when compared with each other, should be made at the same interval after the same food has been taken.

The question now is, what is the normal time during which the process of secretion goes on under normal conditions? An exhaustive series of experiments on the different phases of digestion in animals, and particularly in man, was wanting, till made some years ago by Dr. Boas and myself, who turned our attention specially to the latter branch of the subject. Our experiments, in the first place, confirmed the statements already made by Tiedemann and Gmelin (1826) and others, that an empty stomach under normal conditions contains no gastric juice, and that irritation of the mucous membrane is necessary to produce secretion, although this irritation may be produced in very sensitive persons by the mere introduction of the sound or tube, or by swallowing ice, cold water, pepper, &c. For instance Edinger,* who, according to the old method of Spallanzani, caused his patients to swallow small sponges, compressed to the size of a pill and fastened to a silk thread, discovered that in thirteen cases out of fifteen there was no discernible quantity of hydrochloric acid, but in two cases there were "faint indications" of its presence.

---

* l.c. p. 40.

We must bear in mind that in the case of persons who have gone an unusual time without food the introduction of the tube will occasionally produce, not a secretion of the mucous membrane, but a regurgitation of bile and other duodenal contents into the stomach. This is, properly speaking, not a normal process, and later on you will see that you may easily recognise it. Schreiber† and Rosin,‡ in consequence of recent more extensive experiments, ascribe to the stomach a continuous secretion of gastric juice. Schreiber at least succeeded, in the cases of fourteen or fifteen persons examined by him, in extracting through the tube 2 to 50 cc. of a fluid containing hydrochloric acid, which was generally quite clear, containing some mucus, and no remains of food, but which in some few cases, however, was tinged green or yellow. In the case too of ten out of eleven persons, all of whom had fasted several hours, and some most of the day, a fluid containing hydrochloric acid was obtained by prolonged and repeated expression. Schreiber believes himself to be in a position to state, that this is not a secretion induced by the introduction of the sound or tube into the stomach, but he does not express any opinion as to whether the fluid found was the result of a process of secretion which continues during the whole period that the stomach is empty, this is to say, during the night, or if not, at what time we may suppose it to begin. Leo,[*] "almost without exception," and Kinnicutt,[†] found hydrochloric acid in the contents of the stomach of infants who had fasted for some time, but consider this to be the remains of a digestive process which had already taken place; while Rosenheim,[‡] in harmony with the results of our experiments, believes that an empty stomach in its normal condition, if it contains traces of hydrochloric acid at all, never does so to a greater extent than 0·04 per thousand. In spite of Schreiber's experiments I cannot believe that the glands of the stomach form any exception to the universal rule followed by secreting glands, or that they secrete without a specific stimulus, any more than a steam engine works when the supply of fuel is stopped. I am still inclined to think that the irritation caused by the introduction of the tube, if only by means of reflex action from the mouth, is sufficient in the case of most persons, who are not rendered thoroughly callous by long habit, to produce more or less secretion of the gastric juice; and this is all the more likely to happen if they have fasted for an unusual time, in exactly the same way as the salivary glands of a dog will secrete, when you hold a piece of meat in front of him, in proportion to the length of time that the animal has remained without food. I consider this to be proved by the fact, that in the case of five patients, all accustomed to the introduction of the tube, when I have examined their stomachs while they are in bed shortly before taking their accustomed breakfast, I have brought up inconsiderable quantities of light-coloured, sometimes yellowish mucus, which although it has sometimes given a faint acid reaction, yet in no instance has given a reaction for HCl with tropæolin, or phloroglucin-vanillin. The patients were indeed suffering from disordered stomachs, but after taking food all secreted gastric juice containing hydrochloric acid. At any rate, the contradictory results produced by the experiments made by the different authors quoted, prove to us that special conditions, under which one patient will react more easily and quickly than another, must be taken into consideration, and that, as we shall see later, conditions may exist which may lead to a morbid increase of secretion.

---

* Edinger. Zur Physiologie und Pathologie des Magens. Deutsches Archiv. f. klin. Med. Bd. xxix. 1881.

† J. Schreiber. Die spontane Saftabscheidung des Magens "im Nüchternen" und "die Saftsecretion des Magens im Fasten." Arch. f. experimen. Pathologie und Pharmakologie. Bd. xxiv. p. 325.

‡ H. Rosin. Ueber das Secret des nüchternen Magens. Deutsche med. Wochenschr. 1888, No. 47.

---

[*] Leo, l.c.

[†] Kinnicutt. Diagnosis of diseases of the stomach. Transact. of the Associat. of American Physicians. Vol. v. p. 216.

[‡] Rosenheim, Th. Ueber die Säuren des gesunden und kranken Magens bei Einführung von Kohlehydraten. Virchow's Arch. Bd. cxi. p. 419.

As typical food we give the patient the simplest possible nourishment, the so-called Ewald's test breakfast, that is to say, he takes on an empty stomach an ordinary dry roll, and a fixed quantity—about three-quarters of a pint—of fluid, either warm water, or very weak tea (which latter, however, from the nature of the tea leaf, may easily produce an acid reaction). The roll contains, according to König, 7 per cent. N., 0·5 per cent. fat, 4 per cent. sugar, and 52·5 per cent. non-nitrogenous extractive matter, to which must be added 1 per cent. ash. Thus we see that the roll contains all the materials required for nourishment, and, to take an approximation of its weight, may be assumed to be about 35 grammes. Our trial breakfast contains albuminoid substance, sugar, starchy matter, fat, non-nitrogenous extractive matter, and salts; tea belongs to that class of food which exercises a great influence over the secretive activity of the stomach. Klemperer recommends half-a-litre of milk instead of tea, in order to put the digestive activity of the stomach to a somewhat severer test. By the assimilation of a breakfast of this kind the stomach is provided with all the food materials which it is in the habit of receiving, and it is a strong recommendation in its favour, that in a comparatively short time liquefaction, or at least softening of the ingesta takes place, so that we can soon bring the contents of the stomach back through the tube, while in cases where coarser ingesta, and particularly meat, have been taken, the fenestræ of the tube are likely to be obstructed, even after a far longer interval, and, consequently, nothing can be brought up. This is the reason why many authors consider the stomach pump to be indispensable on account of the greater force which it permits to be employed. Our method has the further advantage of being cleanly. Should the patient vomit, which occasionally but not often happens, the contents of the stomach will not be greasy, slimy, and ill-smelling, as is the case after a full meal, but will consist of comparatively clean bread crumbs. All these advantages speak in favour of our method. On the other hand, it cannot be denied that the assimilation of such a very simple meal does not make any formidable demands on the activity of the stomach, and that a stomach, the chemical apparatus of which is sufficient for such simple food, may be unable to cope easily with larger quantities of a more elaborate kind, through lack of secretive power. These objections apply in a still higher degree to the exclusive use of experiments made with small quantities of albuminates (the whites of one or two hard-boiled eggs) according to the method employed by Jaworski, which on this account I cannot consider a good test of the digestive powers of the stomach. If, however, after the test breakfast has been taken, there should be any special cause which makes it desirable to test the digestive powers still further, it is quite easy to cause the patient to eat different food, and to observe whether that also is sufficiently digested, and a sufficient secretive activity is brought into play.

These more elaborate test meals, which are generally taken in the middle of the day, are made use of by other clinicians and investigators (Leube, Riegel), and the food usually consists of an ordinary dinner—thin soup or gruel, a good-sized piece of meat in the shape of a beef-steak, and bread. It is of course necessary in every case to give the same quantity of food—about 400 grammes of soup, 60 grammes of meat cut very small, and 50 grammes of white bread—and this is more difficult to accomplish, while we must make the examination always at the same interval after the food has been taken.

A considerable fallacy may be caused, as Einhorn* has pointed out, from the greater quantity of acid salts introduced, should we not know the absolute quantity of hydrochloric acid taken, if the total acidity is calculated as hydrochloric acid. While at the end of an hour after the test breakfast recommended by me you will find the process of digestion in full course, and will be able to deal separately with its component parts, in the case of a more elaborate meal the interval of an hour will produce few if any signs of digestive activity; it will be necessary to wait from four to six hours, according to the nature of the food taken, and, under some circumstances, to the activity of the organs, before the results of digestion can be properly ascertained; as the fluid taken during a meal always disappears more quickly than the solid food, making the contents of the stomach in the course of time more and more like pap, it may easily happen that, after such an interval, fluid is not present in sufficient quantities for the purposes of examination. The first objection, that is to say, the longer interval required, is of little weight, the important thing being to obtain results valuable as compared with each other, but the advantages possessed by my test breakfast are so great, that I see no cause to alter my method of procedure, particularly as numerous control experiments show—especially in cases of carcinoma of the stomach—that the same results are obtained by it as by the use of more elaborate meals. It is particularly convenient in most cases where an examination is required (indeed, in consulting practice it is almost impossible to act otherwise) to let the patient, whose condition has been ascertained the day before, come early in the morning, and by this means, as we have already said, reduce as far as possible the unpleasantness of the proceeding.

---

* Einhorn. Probefrühstück oder Probemittagbrod? Berl. klinische Wochenschr. 1888, No. 32.

The contents of the stomach, when brought up and filtered, yield a fluid clear as water, under certain conditions, however, slightly tinged yellow or brown. The fluid which I now show you is the result of an examination made this morning on a female patient.

You know that the stomach contents in their normal condition contain acids, and especially hydrochloric acid, the degree of acidity varying according to the activity of the organ and the different stages of digestion. The character of the acids which communicate their acidity to the contents of the stomach also varies. *We must therefore first test whether the contents of the stomach are acid, what degree of acidity they possess, and what is the nature of the acid which causes the acidity.* During the normal digestion of the test breakfast, if the reagents which we are about to mention are employed, the following three stages occur. If the contents of the stomach brought up from ten to fifteen minutes after the test breakfast has been taken are acid, the acidity is caused either by acid salts or by free acids, or by a combination of both factors. If, however, we examine into the nature of the free acids when present, we shall discover, according to the reaction given by our reagents, that they consist of lactic acid. This lactic acid preponderates for the first half or three-quarters of an hour, and the colour reaction for hydrochloric acid gives negative results; then a stage is entered upon in which distinct traces of hydrochloric acid are found together with lactic acid. At last the lactic acid disappears altogether, and under normal conditions, at the end of the first hour, hydrochloric acid only is found in the contents of the stomach. We must not, however, understand by this that it has only just been secreted. Its secretion, indeed, begins probably at the time that the ingesta enter the stomach, but during the early stages its presence cannot be proved by the ordinary reagents, partly because it is combined, and partly because the delicacy of the reaction is affected by the presence of salts. Thus we see that during the course of digestion the curve of the free acidity reaches a maximum which seems to be somewhat higher according to the quantity and quality of the food taken (2·0 to 3·3 per thousand as compared with 1·5 to 2·0 per thousand), without this difference in the amount of secretion being accompanied by any corresponding variation in the action exercised upon it by disturbing influences of any kind. In other words, disturbances in the digestive process can be traced as clearly when a small meal has been taken as in the case of a more elaborate one, because—within certain limits, which reason tells us must not be exceeded on either side—the question is one of relative, not of absolute value.

The process described above is thoroughly typical, and will always be observed, if the methods of which we shall now speak are employed. The clinical and practical importance of it lies in the three stages of acidity which have been proved to exist, the changes in which allow of a reference to pathological conditions. It makes no difference that Cahn and von Mering,* as well as Ritter and Hirsch,† and finally Rosenheim,‡ have by means of very complicated methods discovered another condition, that is to say, the persistence of very small amounts of lactic acid during the later stages of digestion. It is possible to demonstrate, as I have myself shown in several instances, that small quantities of lactic acid exist under normal conditions in the filtered contents of the stomach, at a time, that is to say, at the end of the first hour, when the simple reaction for lactic acid employed, and presently to be described by me, no longer gives any positive results (see page 245).

---

* Cahn and v. Mering. Ueber die Säuren des gesunden und kranken Magens. Deutsches Arch. f. klin. Med. Bd. xxxix. Heft 3 u. 4.

† l.c. p. 434.

‡ Rosenheim. Ueber Magensäure bei Amylaceenkost. Centralblatt f. d. medicin. Wissensch. 1887, No. 46; and Virchow's Archiv. Bd. cxi. p. 414.

But this very circumstance, its slight delicacy, makes it valuable. As we do not possess an easy method for the quantitative estimation of lactic acid by which we can quickly and easily recognise an abnormally increased formation, a reaction such as this is valuable, because it only occurs when there is a pathological increase of this acid in the stage of digestion in question, and I am convinced that the practical value of the three stages of digestion described by Boas and myself will not be diminished by the results of the above-described experimental data, even if they should prove to be constant. The acid reaction of the stomach contents is regulated, under certain circumstances, throughout the entire course of digestion, not only by the free acids but by the acid salts, especially the phosphates of the ingesta. Ordinarily this acidity is small in comparison to the free hydrochloric acid, but under abnormal conditions the acid reaction caused by acid salts acquires importance. The simple fact that the stomach contents give an acid reaction with litmus paper does not indicate whether their acidity is due to free hydrochloric acid or to acid salts; so that it is always important to determine the acidity of the stomach contents, that is, to estimate their acidity by trituration.

We can triturate best with normal soda solution of 1 to 10 (that is, a solution of 40 grammes of caustic soda dissolved in 1,000 cubic centimetres of water, diluted ten times), and estimate the result with litmus paper or phenolphthallin. The latter method does not give quite such definite results as by alternate testing with blue and red litmus paper, but is performed more readily and quickly, and is sufficient in practice. An alkaline reaction of the stomach contents requires estimation of the alkalinity by means of 1 to 10 normal acid solution. Phenolphthallin, a direct derivative of benzol, is a clear yellow substance soluble in alcohol or spirit, and possesses the property on the addition of acid or neutral fluids to remain clear, but on the addition of a trace of alkali to become carmine red. We add, as I am now doing, to a measured quantity of stomach filtrate—5 or 10 cc.—some drops of phenolphthallin, and allow the 1 to 10 normal soda solution to run in from the burette until a distinct red colour is produced which does not disappear on shaking. A slight turbidity or yellowness of the stomach contents does not interfere with the precision of the test, as most stomach contents become whitish on the addition of alcoholic solution of phenolphthallin.* I have used in our case for 10 cc. of stomach contents 6·1 cc. of soda solution. In general the acidity of 10 cc. varies, when examined in this way one hour after a test meal, from 4 to 6 to 6·5 cc., anything above or below these limits being pathological. It is better to give the acidity in percentages of the decimal normal solution; for example, we understand by 61 per cent. acidity that 61 cc. of 1 to 10 normal soda solution were required to neutralise 100 cc. of filtered stomach contents. This does not prejudge the question whether the acidity is caused by free hydrochloric acid or not. But to anticipate this point, if we have satisfied ourselves that the acidity is not due to acid salts, but to free acids, and, indeed, to free hydrochloric acid, we can calculate it as chlorides. 1 cc. (1 to 10) normal soda solution is equal to 0·003646 chlorides, so that the number of cc. employed to produce a permanent red colour, multiplied by 0·03646, gives the percentage of pure chlorides in the stomach contents, if 10 cc. of stomach filtrate were triturated. Accordingly, in the present case, we obtain 0·22 per cent. of hydrochloric acid, an amount which is within the normal limits.

In order to decide whether the acidity of the stomach contents is caused by free acids or by acid salts, we use preferably the aniline dyes, and especially tropæolin, a dye which is sold as tropæolin 00—l'orangé poirier of the French. This dye, a beautiful orange powder in the dry state, forms in saturated alcoholic or watery solution a dark yellowish red fluid, which in the presence of traces of free acid—to about 0·25 per mille and less—turns dark brown, while in the presence of acid salts it turns clear straw yellow. I will take some drops of this solution and add to it some 0·05 per cent. dilute hydrochloric acid. You see that the fluid becomes dark brown. If, on the other hand, I add to the tropæolin some acid phosphate of lime, no brown coloration occurs, but it becomes a pale straw yellow. Tropæolin, therefore, informs us whether the stomach contents contain free acids or not.

---

* It is best to use a so-called Kleinert's burette, unless you are making daily estimations. It differs from the ordinary burette with a glass tap, by the glass tap being placed at the upper end above the zero point of the graduation, while the other end is somewhat drawn out and closed with a glass stopper. In order to fill the burette the lower end is dipped into the fluid, which is sucked up through the open tap. When this is shut the atmospheric pressure keeps the fluid in, and when we desire to begin triturating we have only to open the tap, just as if it were below. After using it the lower opening is closed with a well-fitting stopper. In this way you can avoid the troublesome sticking of the tap which occurs in ordinary burettes not in constant use from the formation of carbonates, and also the dripping.

A similar reagent is the so-called congo-red, introduced by Hoesslin,[*] a carmine-red powder, which in solution becomes a peach or brown-red colour, but turns sky-blue on addition of free acids, and is rather more delicate than tropæolin, as it indicates the acidity of a fluid which contains 0·02 per mille of free acids. Congo-red is not altered by acid salts.

In all these reactions the fluid to be tested—and this applies equally to the reactions to be described later on—must be in excess of the coloured solution, or the excess of dye would obscure the result. It is best to take 5 or 10 drops of the colouring solution, and to add to them 1 to 2 cc. of stomach filtrate. But it should be remarked that the delicacy of this and the following reactions in the presence of salts and albuminates, or albumose and peptone, is considerably interfered with. Certain salts, for example common salt, manifestly form with the dyes very close, though not proper, chemical combinations, which are not decomposed by the addition of small quantities of acid; but the albuminates and their derivatives, on the other hand, form loose chemical compounds with the free acids and arrest them, so that in this way, though indirectly, the reaction is destroyed. However, we can determine roughly whether we have to do with free acids or acid salts, and infer from the intensity of the reaction the quantity of free acid present.

Let us see in these stomach contents, whose acidity equals 61 per cent. (equivalent to 0·2 per cent. HCl), whether free acid is present or not. The red solution becomes indeed feebly blue, but much less than with this control solution of 0·2 per cent. hydrochloric acid. The same result occurs with tropæolin. Therefore, gentlemen, in addition to a free acid which is present in these stomach contents, there must be acid salts as well.

How can we learn the nature of the free acid?

For the *recognition of hydrochloric acid* the aniline dyes are mostly used, as their watery or alcoholic solutions react in a definite manner in the presence of free hydrochloric acid. Klemperer[†] deduces, from the chemical constitution of methyl-violet, the conclusion that they, or at least methyl-violet, form a loose compound, which is decomposed again by any kind of organic or inorganic bases, as well as by albuminous bodies and their derivatives, so that the original shade of colour returns, or in other words, as I have already explained above, that the said matters have a greater affinity than methyl-violet for hydrochloric acid. I have already mentioned tropæolin and congo-red. Another dye is methyl-violet in such dilute solution that it has a rose-violet colour. On the addition of hydrochloric acid, up to 0·024 per cent., the solution changes to a sky-blue colour, which, as you may see when we hold the two tubes against the light, surpasses even that of the control test. Another dye is emerald or malachite green, which in solution is dark green with a bluish green reflection; on addition of free hydrochloric acid it becomes a splendid moss-green. The "vert brillant," so warmly recommended by Lépine, is probably identical with this. But emerald green, in my experience, is less delicate than methyl-violet or congo-red, and fuchsin is still less delicate; this is also called rubin or aniline red, and its deep red solutions become yellow on the addition of acid. Large quantities of acid are, however, needed to produce this yellow colour. Only when I had added a great quantity of an acid double the strength of that I usually employ, did the fluid begin to fade and finally take on a yellow colour. Fuchsin or aniline red, originally recommended as equally valuable with methyl-violet, is not so suitable for our purpose. It is best to use congo-red or tropæolin, either in solution, or as I show you here, in the form of test paper, that is, filter paper soaked in a saturated solution of the dye and then dried. By heating these over a flame the reaction may be made more significant (Boas), as in the presence of small traces of free acid a lilac colour appears in the heated part of the paper. We can attain the same end by putting some drops of the colouring solution in a porcelain capsule, and spreading it out in a thin layer by tilting the capsule (Uffelmann). Then if we add a few drops of the fluid to be tested and heat it over a flame we get quite as good a reaction. According to Kahler* we may draw up the stomach filtrate into a pipette, and carefully float a layer of colouring solution upon it. The reaction takes the form of a thin ring at the point of contact of the fluids. In all these the object is the same, to bring proportionate quantities of reagent and reactive together in a certain fashion, and this is naturally easier in small quantities on a white porcelain surface than in a test tube; but in principle all are the same.

---

[*] v. Hoesslin. Ein neues Reagens auf freie Säuren. Münch. med. Wochenschr. No. 6, 1886.

[†] G. Klemperer. Zur chemischen Diagnostik der Magenkrankheiten. Zeitschr. f. klin. Med. Bd. xiv. p. 156, 1888.

---

* **Kahler.** Ueber die neuen Methode zur Untersuchung des kranken Magens. Prager med. Wochenschr. 1887, Nos. 32 and 33.

There is a degree of uncertainty in the reaction of these aniline dyes with hydrochloric acid, because they change colour also with other acids, especially organic acids, or, as I have said above, other substances may diminish their sensitiveness. Unfortunately these substances are just those which we commonly meet with in the stomach contents during digestion—albumen and its derivatives, saliva as an albuminous and saline fluid, chlorides and phosphates—of which the same is the case, as we have already stated above, in connection with the demonstration of the presence of free acids. They either produce a deceptive change of colour, or prevent it. If I add to a solution of methyl-violet a watery solution of albumen, you will see that the previous red-violet solution assumes a distinctly different blue colour. A control test made with hydrochloric acid permits us to recognise a slight difference between it and that caused by albumen, but still only when the two are held side by side, and, as stated, when pure hydrochloric acid is employed. I will pass round to you a third test tube, in which you see albumen and hydrochloric acid together, and where you observe an intermediate shade of colour. By holding the test tubes against the light you will be able to recognise the difference or resemblance between them. The derivatives of albumen behave in the same way; for example, the different albumoses, syntonin, propeptone, peptone, leucin, and, finally, also certain salts, above all common salt, which is so abundantly present in our food. If you add some concentrated solution of common salt to a solution of methyl-violet (if it is not too concentrated, you can go up to a 5 or 10 per cent. solution), and add to it some gastric juice or pure hydrochloric acid, the reaction occurs much more feebly than before, or entirely fails. On the other hand, the blue colour of methyl-violet solution treated with hydrochloric acid solution disappears if, in proportion to the strength of hydrochloric acid employed, you add a definite amount of albumen, albumose, or peptone solution, and it does not occur at all if you previously add them to the hydrochloric acid. *In fact, under* *these circumstances the acids are fixed and form loose compounds or are only absorbed, so that they react no longer as free acids.* The more delicate the reagent is, the more can we add of such substances without interfering with the reaction, provided the solution of acid is sufficiently strong, while the reverse is the case if we use solutions which contain the least trace of acid that can affect the reagent. If B. Seemann * proved that the mixture of equal parts of half per cent. peptone solution and 2 per mille solution of hydrochloric acid gives the methyl-violet reaction, on the other hand Krukenberg† states that the phloroglucin reaction about to be described occurs when one part of a 4 per cent. peptone solution is mixed with two parts of the same (2 per mille) acid solution, so that phloroglucin-vanillin is about four times more delicate then methyl-violet, as you will find stated in the collected tables appended to this lecture. The other dyes already named comport themselves like methyl-violet; some, tropæolin, for example, are influenced somewhat more distinctly by salts, others, such as emerald-green and congo-red, more by albuminous substances. These conditions may give rise to serious errors, and have been the causes of many controversies which have arisen on these questions, especially as we have not to do with pure acids but with the gastric contents, which possess a certain colour of their own, as in this specimen. As early as in 1880 I remarked,‡ and specially demonstrated in the case of the methyl-violet reaction, that it "is prevented by the presence of small quantities of blood, and that it is greatly enfeebled or entirely prevented by solutions of chloride of leucin and tyrosin, as well as by albumen and peptone." I show you in these rather turbid stomach contents, which come from one of my patients, that a distinct blue coloration occurs with methyl-violet, which, however, is not caused by free acid. Then I repeat the test for the latter with tropæolin, and we get a darkening, or rather a turbidity, on the addition of the turbid fluid, but no distinct brown coloration. Free acid is absent, although the methyl-violet showed a change of colour. To the previously mentioned organic acids, which react to the colour solutions, belong lactic acid, acetic acid, and butyric acid; still, they require to be more concentrated than they are in the stomach in order to be confounded with hydrochloric acid. The presence of these organic acids together with hydrochloric acid does not diminish the delicacy of the hydrochloric acid reaction. A table of these facts will be found at the end of the lecture.

---

* Seemann. Ueber das Vorhandensein freier Salzsäure im Magen. Zeitschr. f. klin. Med. Bd. v. 1882.

† R. Krukenberg. Ueber die diagnostische Bedeutung des Salzsäurenachweises bei Magenkrebs. Inaug.-Dissert. Heidelberg, 1888.

‡ Ewald. Ueber das angebliche Fehlen freier Salzsäure im Magensaft. Zeitschr. f. klin. Med. Bd. i. p. 622.

Gentlemen, these relations of the aniline dyes create a necessity for other tests free from these disadvantages. Recently quite a number have been described, of which only the two following have proved of service.

In No. 40 of the "Centralblatt für klinische Medicin," 1887, Dr. Günzburg, of Frankfort, has described a reagent which is so definite, and at the same time so simple, that it is very seldom that any control is required by other reagents. My original recommendation* of it has been confirmed from many sources. A splinter of deal soaked in phloroglucin solution turns red on touching it with hydrochloric acid. This change of colour is, as Max Finger has proved, caused by the presence of vanillin. If we make an alcoholic solution of—

2 grms. phloroglucin
1 ,, vanillin
80 ,, absolute alcohol

we get a clear yellow solution, which possesses the smell of vanilla or of fresh pine wood, becomes dark golden red in time on exposure to the light, and therefore should be kept in a black bottle. If you put some drops in a capsule and add some concentrated hydrochloric acid to it a bright red colour is produced, accompanied by the formation of small red crystals. If one uses weak solutions, such as, for example, dilute hydrochloric acid which contains only 0·05 per cent. and less, or gastric contents, the fluid does not change on the instant of adding it; but if the capsule is gently heated over a lamp, so that the fluid does not boil but slowly evaporates, at the border of the evaporated drops a bright red patch or small very fine red streaks appear, which denote with certainty the presence of free hydrochloric acid. If we cool it rapidly by blowing on it we see the beautiful red streaks appear at the edges. It is not necessary to filter the stomach contents before testing it. One or two drops in a capsule or on a strip of filter-paper with the same quantity of the reagent are sufficient. This reaction has the great advantage over others that it is not interfered with by the presence of albumen or of salts, so long as the latter are within the ordinary limits of concentration, and organic acids, of which I am going to speak just now, do not affect it. Its delicacy much exceeds that of all other tests. Whilst tropæolin paper detects less than 0·3 per mille of hydrochloric acid, Günzburg's reagent, as I have proved, will discover less than 0·05 per mille. The reaction is always bright red, or with very small quantities pale rose colour, but never brown, or brownish yellow, or brownish red. When these colours occur they are due to overheating and the formation of combustion products of organic matter. The appearance of the red streaks, or a corresponding red blush at the edges of the drops on *gentle* heating or slow evaporation to dryness, is decisive and characteristic. On heating any albuminous substance very strongly, after evaporation a deep red central coloration is caused, but which cannot be confounded with the hydrochloric acid reaction. If a solution of albumen or peptone is treated with dilute hydrochloric acid the reaction takes place just as with the above-named reagents, when the capacity of the albuminous substance for absorbing the acid is satisfied.

---

* Ewald. Verhandlungen des Vereins für innere Medicin zu Berlin. Deutsche med. Wochenschr. 1887, No. 46.

This condition of the reagent permits an approximate quantitative estimate of the amount of free acid for which we have not hitherto possessed any easy and trustworthy method. By successive dilutions of stomach contents giving Günzburg's reaction to $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{10}$, &c., until the reaction no longer occurs, we can estimate approximately the amount of actually free hydrochloric acid, as the lowest limit is about $\frac{1}{20}$ per mille. If the red colour, for example, is still obtained with the twentieth dilution, the gastric juice contains 1·0 per mille, or 0·1 per cent. of free hydrochloric acid. But one may make a rough guess at the amount of acid according to the intensity of the red coloration.

Boas* has discovered quite as practical and delicate a reagent in resorcin. We employ a solution of resorcin 5, white sugar 3, dilute spirit to 100, and add three to five drops of this solution to five or six of stomach contents in a porcelain capsule and warm it over a flame gently to dryness. In the presence of 0·05 per mille of free hydrochloric acid we obtain a rose-coloured surface, which, as in Günzburg's test, is never occasioned by organic acids however concentrated.

---

* Boas. Ein neues Reagens für dem nachweis freier Salzsäure im Magensaft. Centralbl. f. klin. Med. 1888, No. 45.

Gentlemen, after enumerating the most important reagents for the recognition of free hydrochloric acid, of which those of Günzburg and Boas, and tropæolin can be best recommended for their accuracy and definiteness, we will now proceed to discuss the tests for the other acids present in the stomach contents, and their relations to hydrochloric acid or their injurious influences.

We are now concerned with the *demonstration of organic acids*, lactic acid, acetic acid, and the various fatty acids, especially butyric acid. After it was once ascertained that the acid of the gastric glands is hydrochloric acid and that only, it was long thought that the occurrence of organic acids, and especially of lactic acid, was always pathological. By recent researches, especially by the investigations which I, in collaboration with Boas, have carried out on living men with healthy stomachs, it has been completely demonstrated that in the first stages of digestion some organic acids are normally present. But when organic acids are present in great amount in the later stages of digestion we were able to prove by our experiments that they are always of pathological origin. For the formation of these organic acids it is characteristic that they are derivatives of bodies, such as starch, sugar, or fat and albumen, which are normal constituents of the stomach contents, from which they are formed by fermentation—only sarcolactic acid, so far as we yet know, appears to be always derived from meat, of which it is a constant constituent.

Respecting lactic acid there are two kinds, the lactic acid of fermentation, and sarcolactic acid. They are distinguished more by their origin than by their chemical constitution. For us the former only is of any importance, otherwise the same test applies to both. Chemists have, as we know, a very prolonged process for demonstrating lactic acid, but which is too complicated for daily use. Uffelmann has suggested a simple and quick reaction of lactic acid suitable to medical practice: solutions of dilute neutral perchloride of iron become canary yellow in the presence of lactic acid. If I take some perchloride of iron, diluted so that it is nearly colourless, and add a trace of lactic acid to it, you see it becomes at once canary yellow. The reaction is a little uncertain, or rather difficult to recognise, as it consists only in a variation of intensity in otherwise the same shade of colour, therefore it is better to prepare the reagent by adding a drop or two of concentrated carbolic acid to a dilute solution of perchloride of iron, or a certain number of cc. of dilute carbolic acid solution may be added, for example, 10 cc. of a 2 or 5 per cent. solution—it does not matter which—and diluted with water until the solution becomes a beautiful amethyst blue.

A few drops of dilute lactic acid solution (to 0·0 5 per mille) cause, as we see, the characteristic yellow colour to replace the amethyst blue. The delicacy of the reaction is so great that 2 cc. of Uffelmann's reagent give a distinct reaction in the presence of 0·8 cc. of lactic acid of 0·01 per cent. strength, with 0·6 cc. the reaction is faint, and with 0·3 cc. no yellow coloration can be observed. Unfortunately this reaction is not quite free from fallacies, as not only free lactic acid, but also lactates give this yellow colour. This would matter little, as whether we have lactic acid or lactates is the same to us; in any case it would prove that lactic acid had been or still was present in the stomach. But the reaction may be caused also by alcohol, sugar, and certain salts, especially phosphates, which are very often present in the stomach contents. If I add some phosphate to this solution—I have here, for example, a solution of phosphate of soda—you see a straw-yellow colour appears, which differs considerably from the characteristic canary yellow, but when the stomach contents themselves are yellowish, may very closely resemble the canary colour. Under such circumstances we must employ the methods that chemists use, but in a simplified form, that is, we must extract the fluid to be examined with ether, evaporate this, and perform the reaction with the residue. The procedure is very simple, as I show you here. Let us test, for example, some acid gastric juice which gives a deep yellow colour with Uffelmann's reagent, but no free acid reaction with tropæolin, so that it is doubtful whether the yellow reaction is due to traces of free lactic acid or to lactates, or to acid salts. As lactic acid when free in 0·75 to 0·5 per mille solutions is easily taken up by ether, the ethereal residue redissolved in water must be acid. We first shake with ether. This may be done by using a separation funnel, or more simply by putting a little (2 to 5 cc.) stomach contents in a test tube, shaking it well with ether, letting the ether settle, which it does very rapidly, and then decanting it off. This can be repeated with several portions of ether, so that in all about 25 or 30 cc. are used. The ether is evaporated over hot water without an open flame. In the residue redissolved in a few drops of water Uffelmann's reaction is performed by letting one or two drops of the reagent flow gently over it. The reagent and reactive must be in proper proportions. If we add too great quantities the reaction is obscured. This may have been the cause that Cahn, of Strasburg, for example, could not at first confirm my statements respecting the presence of lactic acid in the digestion of meat. Our residue gives an acid reaction, and answers to Uffelmann's test. That we found no free acid with tropæolin shows you how much more delicate is the lactic acid reaction with Uffelmann's reagent than is that for free acids with tropæolin. Whilst we could demonstrate no free acid with tropæolin because the reaction was obscured by acid salts and only very small traces of free acids were present, with Uffelmann's reagent we have demonstrated its presence with complete certainty.

Fatty acids, especially butyric acid, when present in a concentration of 0·5 per mille and upwards, colour Uffelmann's reagent pale yellow with a reddish or brownish lustre. Fat is easily recognised in the stomach contents, as, after evaporation of the ether, oily droplets are found in the watery residue. The butyric acid is soluble in water and separates from the watery ether residue in oily drops on the addition of some little fragments of calcium chloride.

The best practical test for acetic acid is the nose. Its typical smell is not easily overlooked when it is present in large quantities. It may be demonstrated by neutralising the ethereal extract with sodium carbonate and adding neutral solution of ferric chloride. A beautiful blood-red colour appears in the residue, otherwise only produced by formic acid, which is never met with in the stomach.

Finally, we must mention alcohol, which only occurs in the stomach when the yeast fermentation is very pronounced. It may be looked for by means of Lieben's iodoform reaction in the distillate of the stomach contents, of course only when it is certain that the patient has not taken alcoholic drinks or medicines (tinctures, fluid extracts, &c.) for a long time. The demonstration of the presence of alcohol is of no diagnostic significance, so I shall not say more respecting it.

The delicacy of the above-named reagents is shown in the following table, and I am spared going more deeply into the question, as I have already shown how and in what sense they are to be understood, that is, that when stomach contents are to be tested, it is always a question only of the amount of *free* hydrochloric acid present, and not of that which is loosely and unstably combined. The antagonistic effects of such components of the mixture as acids, salts, and albumoses, are only so far important, as they either combine with the acid or turn it out of its combinations.

Positive reaction in the presence of Hydrochloric Acid.	per mille.	Lactic Acid. per mille.	Butyric Acid. per mille.
Methyl-violet	0·24	4	5—6
Tropæolin	0·3	Over 10	Over 10
Emerald-green	0·4	10	Over 10
Congo-red[*]	0·02	0·2	0·4
Günzburg	0·05	—	—
Boas	0·05	—	—
Uffelmann	—	0·1	0·5

With respect to this table, I should state that the reaction depends greatly upon the relative proportions of the components, and that the figures refer only to the smallest demonstrable quantities. When it is stated, for example, that the methyl-violet reaction fails to detect HCl in the presence of 0·5 per cent. solution of peptone, it means that the methyl-violet reaction does not appear when it is tried in a mixture of equal quantities of 0·24 per mille hydrochloric acid and 0·5 per cent. peptone solution.

Gentlemen, the employment of the above-described reagents tells us whether free hydrochloric acid is present at a definite time after eating, but we do not learn—or only approximately from the intensity of the reaction—what quantity of free hydrochloric acid is present, and we learn nothing respecting the important question whether the gastric glands have secreted hydrochloric acid, or how much. It may be that the hydrochloric acid has been produced, but has combined with bases and organic substances. Under normal conditions, the work of the gastric glands appears to be so regulated that they secrete as much hydrochloric acid as may be necessary to produce an excess of the acid, that is to say, free acid is present in such quantities as to form a curve, which first rises and then sinks as digestion proceeds. But under certain pathological conditions free hydrochloric acid is absent, and it has to be determined whether the stomach produces no hydrochloric acid, or whether it is only insufficient.

---

[*] The so-called congo-paper, that is, filter-paper impregnated with a concentrated solution of the dye, is less delicate, and reacts, as Boas and Leo state, first with 0·1 per mille. In the presence of lactic or butyric acids and a little hydrochloric acid it turns greyish blue instead of ultramarine, and I agree with Boas (Deutsche med. Wochenschr. 1887, No. 39) that a distinct blue colour does not occur with less than the above-stated concentration.

Respecting the former question, the *quantity* of free hydrochloric acid, besides the complicated methods of Rabuteau and Cahn and von Mering,* which are not free from objection, two methods can be recommended for their ease of performance and their practical utility. Mintz† adds to stomach contents containing hydrochloric acid normal soda solution (1 to 10) until the phloroglucin reaction fails. Then the quantity of alkali employed expresses the amount of free hydrochloric acid present. By special experiments Mintz has shown that the presence of free lactic acid or albumoses and albuminates combined with hydrochloric acid does not interfere with the result, that is, that the free hydrochloric acid combines first with the alkali. If, for example, the total acidity of the stomach contents=60 cc.of dilute normal soda solution for 100 cc. of the gastric juice, and 10 cc. of this gastric juice is triturated with the soda solution until Günzburg's reaction fails to appear, which we may suppose occurs with 1·6 cc., the acidity is due to 16 parts of free hydrochloric acid, or the amount of free hydrochloric acid=16 × 0·00365 or 0·06 per cent., that is, 1 cc. of dilute normal soda solution=0·00365 HCl. Dr. Boas ‡ has modified this method by previously removing the lactic acid by shaking with ten parts of ether, and then triturating with the soda solution till congo-paper no longer changes. The number of cc. of soda solution expresses the quantity of free hydrochloric acid present.

---

* loc. cit. Deutsches Archiv. f. klin. Medicin. Bd. 39.

† S. Mintz. Eine einfache Methode zur quantitativen Bestimmung der freien Salzsäure im Mageninhalt. Wiener klin. Wochenschr. 1889, No. 20, and 1891, No. 9.

‡ J. Boas. Allgemeine Diagnostik und Therapie der Magenskrankheiten. Leipzig, 1890, p. 134.

Respecting the estimation of the quantity of free hydrochloric acid not combined with mineral bases, that is, by far the greater part of the hydrochloric acid secreted by the gastric glands, the best method is that of Sjoquist[*] modified by Salkowski.[†] This method depends upon the fact that the acids of the gastric juice, when treated with carbonate of baryta, form salts of barium. On prolonged boiling the barium salts of the organic acids are converted into barium carbonate again, while the barium chloride ($BaCl_2$) remains unchanged. But all the hydrochloric acid not combined with mineral bases, not only the free acid but the acid in loose combination with organic matter, such as albuminates, albumoses, and peptones, is converted into barium chloride. The separation of the barium chloride from the barium carbonate is effected by hot water, in which the latter is insoluble. The barium chloride is converted into barium carbonate by addition of sodium or ammonium carbonate, and the barium carbonate being insoluble in water is precipitated. The carbonate of baryta is collected on a filter, washed with distilled water, and converted again into barium chloride by addition of hydrochloric acid and the excess of acid removed by evaporating to dryness. The residue is then dissolved in water, and a sufficient quantity of bichromate of potassium added when it is triturated with a solution of nitrate of silver, of which 1 cc=0·001 NaCl. The quantity of hydrochloric acid corresponds to the formula $x : t$[‡]$= 36{\cdot}5 : 58{\cdot}5$.

This method gives very exact results, as I have proved by numerous control experiments. It is more certain than Sjoquist's trituration of barium chloride with bichromate of potash, in which it is very difficult to recognise the point when the trituration is completed, and it is more easily performed than von Jaksch's[§] modification, by which the barium chloride is converted into barium sulphate, and the volume of this estimated by weighing. It is noteworthy that our analysis after the method of Sjoquist-Salkowski occupies several hours, on account of its evaporations and boilings, but the actual work takes only a short time.

---

[*] Sjoquist. Zeitschr. f. physiol. Chemie, Bd. xiii. p. 1, 1888. Eine neue Methode freie Salzsäure im Mageninhalt quantitativ zu bestimmen.

[†] Salkowski. Ueber den nachweis und die quantitative Bestimmung der Salzsäure im Magensaft. Virchow's Archiv. Bd. 123, p. 292.

[‡] t=the quantity of silver solution in cc.

[§] Von Jaksch. Sitzungsber. der K. K. Akademie d. Wissensch. in Wien. Bd. xcviii. Abthg. 3, 1890.

The same is true in a still higher degree of the method of Hayem and Winter,* which determines, first, the quantity of free hydrochloric acid present in a definite amount of stomach contents by estimating the chlorine or HCl; and secondly, the quantity of hydrochloric acid combined with organic bases and ammonia. As in Sjoquist's method it is necessary to take three specimens of stomach contents and to determine

A. The total chlorine.
B. The total chlorine less that which evaporates after prolonged heating to 100° C.
C. The chlorine combined with mineral bases.

These figures give

A—B=free hydrochloric acid.
B—C=hydrochloric acid combined with organic bases and ammonia.
A—C=(A—B)+(B—C).

It is evident that these methods consume a great deal of time and are impracticable, or anyway superfluous in practice, as for the most part it is enough to know that free hydrochloric acid is present, and in a few cases also the amount in loose combination (that is, with organic substances). These are the cases in which no free acid is present, and the question arises whether no acid is secreted? But it is never necessary to know how much hydrochloric acid is combined with mineral bases.

The correctness of this view is shown by the following facts: it is not to be doubted that normally the secretion of hydrochloric acid is regulated in such a manner that there is always an excess of uncombined acid (free hydrochloric acid) after saturating all bases (organic and inorganic) which are present. This free hydrochloric acid varies in amount according to the nature of the food, within certain limits, and pathological departures in excess or deficiency (hyperchlorhydria, hypochlorhydria), and may easily be recognised by methods already described of Ewald and Boas, Mintz, Boas, &c. In the case of total absence of free hydrochloric acid, this may be due to insufficient secretion of acid which has been taken up by the bases and organic compounds, or that none at all has been secreted. In the first case we have to do with the fixed (combined with mineral bases), and secondly, with the loosely combined (combined with organic bases and ammonia) hydrochloric acid. The quantity of hydrochloric acid which becomes combined with mineral bases after a simple meal (Ewald's test-breakfast), is so small that in comparison with the loosely combined acid it is of no importance, and it is quite sufficient to estimate the latter by the Sjoquist-Salkowski method. The method of Hayem and Winter is quite unnecessary.

---

* Hayem et Winter. Du chimisme stomacale. Paris, 1891.

LECTURE II.

METHODS—TESTS FOR THE DIGESTION OF ALBUMEN AND STARCH—ABSORPTION AND MOTION—PHYSICAL EXAMINATION OF THE STOMACH.

GENTLEMEN,—The action of the digestive ferment, pepsin, on albuminous bodies is exerted in a series of characteristic conversions of albuminate which I must describe to you. I must tell you that pepsin is made artificially by various makers in different forms. Here you have it as a fine dust-like powder, this is in lamellæ or little thin scales or plates, and finally it may be in granules. The preparations have generally a label stating the power of one part of pepsin to digest, that is, to dissolve, so many parts of albumen. But I shall abstain from giving any opinion respecting the virtues of the various preparations, as they vary from time to time in their preparation. Sometimes one, sometimes another is the best, but in general they do not differ much in activity. Some years ago I made a number of experiments on different preparations, but as the results would not be of value at the present time I shall not attempt to determine which is the best.

The importance of the digestion of albumen is that it implies the conversion of various albuminous bodies, of which I will only name the chief types, egg-albumen, serum-albumen, vegetable-albumen, fibrine, and caseine, into a soluble easily diffusible form, peptone. I have already* gone into the matter in detail, and will confine myself now to the practical results of the facts known to us. You know that between albumen as the beginning and peptone as the end of albuminous digestion there are certain intermediate stages which can be grouped together under the name of albumoses. We need consider only syntonin and propeptone or hemi-albumose. It may be asked, What do these bodies signify to digestion, and by what reactions are they sufficiently characterised for our purpose?

---

* Part I. p. 82.

1. Fluid albumen and syntonin coagulate on heating, that is, at a temperature of about 70° C. (158° F.). Propeptone and peptone are not coagulable by heat. If propeptone is precipitated from its solution in the cold, the precipitate redissolves on heating and comes down again on cooling. Heat is without any influence on peptone.

2. Propeptone and peptone when added to alkaline solution of copper sulphate give a distinct purple red colour, the so-called biuret-reaction. Ordinary albumen or syntonin when added to alkaline copper solution gives a more or less pronounced blue-violet coloration which is often confounded with the biuret-reaction. I have here a solution of peptone, and I add to it some caustic potash and copper sulphate; you see a distinct purple-red coloration takes place, which differs very much from the blue-violet colour of the reaction made with pure albumen; the same is true of propeptone, which I show you here in a solution made from Kemmerich's meat peptone.

3. Albumen and syntonin are precipitated by saturated solutions of sulphate of soda or chloride of sodium and acetic acid in the cold. Syntonin, too, is precipitated from its solutions by neutralisation. Neutral solutions of propeptone are in great part precipitated by saturated solutions of sodium chloride or rock salt strongly acidulated with acetic acid and are dissolved on heating. But a part remains in solution, and can only be separated completely by addition of ammonium sulphate in powder or concentrated solution. Peptone is not precipitated by the last named reagent, nor by any of the following, all of which precipitate albumen, syntonin, and propeptone: nitric acid in the cold and with heat, acetate of lead, acetic acid and potassium ferrocyanide, metaphosphoric acid, ammonium sulphate.

The following tables give a review of the relations of these bodies:—

Coagulated by heat, no biuret-reaction.	Albumen Syntonin	Precipitated by saturated solution of sodium sulphate or common salt and acetic acid in the cold or with heat.
Not coagulated by heat, give the biuret-reaction	Propeptone Peptone	Precipitated by solution of sodium chloride and strong acetic acid in the cold.

Precipitate Albumen Syntonin Propeptone	**Nitric acid.**	
	Acetic acid.	
	Acetic acid and potassium ferro-cyanide.	
	Acetate of lead.	
	Metaphosphoric acid.	
	Ammonium sulphate.	**Precipitate peptone**
	Mercuric chloride.	
	Phospho-molybdic acid.	
	Tungsto-phosphoric acid.	
	Tannin.	
	Iodo-mercuric chloride.	

Let us now, gentlemen, look at the practical consequences of these relations. When we permit gastric juice, which contains pepsin and hydrochloric acid, to act upon albumen, after a certain time we should find in the specimens which we examine either all or some of the different modifications of albumen, according to the nature and strength of the gastric juice. The result of such an examination gives us some idea of the intensity of the digestive processes which have taken place in the stomach. We must first determine whether the stomach contents still coagulate on heating. If they do, then albumen or syntonin, or both, are present; if they do not, then we have to do only with propeptone and peptone. If coagulation occurs, and the reaction is acid, we neutralise it. If we get a precipitate, this consists of syntonin. We filter this off, and to the filtrate we add an equal amount of concentrated solution of common salt, acidulated with acetic acid, and we obtain a precipitate which dissolves on heating, proving the presence of propeptone, and the solution should give the biuret-reaction. We filter off this precipitate and get no precipitate with acetic acid and ferro-cyanide of potassium, but the filtrate gives the biuret-reaction, and forms a precipitate with tannin or salts of the heavy metals or tungsto-phosphoric acid; we, therefore, have to do with peptone, but there may still be traces of propeptone present. Our examination, in particular cases, must be based on these principles, and we must inquire what is the practical value of the demonstration of these different products of the digestion of albumen, and what pathological conclusions may be drawn from them?

Now, gentlemen, it is characteristic that the biuret-reaction, which may be due to propeptone or peptone, should appear as soon as the albumen digestion is in progress, as soon as the pepsin and hydrochloric acid act on the albumen. Let us consider briefly the position of propeptone in digestion.

Is it absorbed as such, or is it at least a necessary forerunner of peptone?

Respecting the former question we know nothing, but the latter may be answered by saying that propeptone appears to be a frequent, but not constant, metamorphosis in the pepsin and hydrochloric acid digestion of albuminates. On the other hand, by the simple action of hydrochloric acid at the body temperature on albumen we may obtain both syntonin and propeptone. As propeptone gives the biuret-reaction as well as peptone, you see that this test by itself does not indicate the presence of peptone, as is often supposed. If we desire to be certain we must first precipitate the propeptone.

Dr. Boas,* in a research carried out in my wards, has proved that propeptone is absent in the digestion of meat, but, on the other hand, that it is present in the digestion of the albumen of plants and eggs. It is, therefore, not a necessary product of the metamorphosis of albumen. Nevertheless its demonstration is significant, because it always occurs in ordinary mixed nutriment, and because the amount of propeptone stands in a certain relation to the energy of digestion.

As we can only in this way arrive at the intensity of the peptone formation, it would be most simple to estimate quantitatively the amount of peptone formed during digestion. Unfortunately, at present we have no easy and sufficient method for doing so; indeed, it is questionable whether, if we possessed it, we should derive any special pathological advantage from it, as the maximum of peptone formation is reached rapidly, and then appears to be kept stationary by some contrivance. Still, this must remain undecided. As things are at present, it is of great value to fix not only the end products, but also the intermediate stages of albumen digestion in a given phase, and to be able to estimate them approximately. This we can do by the demonstration of propeptone. The more propeptone is present, the less peptone has been formed, and eventually will be sent out of the stomach.

We have found, by means of the test breakfast, that with ordinary food, which contains a good deal of vegetable albumen, the digestion of albumen has proceeded so far after one hour, that the portion of propeptone precipitable by concentrated sodium chloride solution and acetic acid is not found at all or only in traces, whilst in abnormally slow digestion it is still abundantly present at this time. We can estimate approximately the peptone present by means of the strength of the biuret-reaction, if we always take the same quantities of stomach contents, caustic potash and copper sulphate, and compare the reaction with a solution of peptone of known strength treated in the same way. But we find that the biuret-reaction often succeeds well, while sometimes none, sometimes very varying quantities of propeptone are present; in other words, that, as Cahn* found in the meat digestion of dogs, the formation of peptone remains at a certain percentage, or is controlled by the removal of formed peptone, whilst as the basis for the calculation of the greater or less rapidity and amount of the conversion of albumen in such cases, we have only the quantity of propeptone formed or still remaining.†

---

* J. Boas. Beiträge zur Eiweissverdauung. Zeitschrift f. klin. Medicin. Bd. xii. Heft 3.

Of course there are cases in which the formation of peptone surpasses the normal figure, also where it is quite insufficient, but it is recommended for the reasons given, to undertake the test for propeptone where the amount of peptone present is apparently normal.

Gentlemen, the following practical example may illustrate and utilise what has been said:—

I have here the filtered stomach contents of a patient, a ship-owner from H——, whom I have had under observation for two years. He is seriously suspected to have cancer of the stomach, although no tumour can be found, and his general condition appears good, without loss of appetite or dyspepsia, though digestion is slow and he is steadily wasting. Repeated observations have never discovered any free acid in his stomach contents. There is no free acid in this specimen, although it is acid, and gives a strong biuret-reaction. Let us see if this is due to peptone or to propeptone. I neutralise it carefully, adding an equal part of concentrated solution of common salt and a little pure acetic acid. There is no trace of cloudiness, so that there is no propeptone. On heating there is a slight coagulation of albumen. We have, therefore, in this case a gastric juice in which there is notably no free hydrochloric acid, in which for years, in repeated examinations, there has been no free hydrochloric acid, yet which forms peptone, and, as it appears, no slight quantity. If you remember, peptone may be formed[*] in the presence of other acids, especially lactic acid, and I show you by means of Uffelmann's reagent that lactic acid is abundantly present in this specimen of stomach contents; therefore this case illustrates the fact that pepsin may be formed or secreted by the gastric glands independently of hydrochloric acid, a point which I have proved already in man by another case, and Cahn has demonstrated in dogs deprived of chlorine[†] (chlorhunger).

---

* A. Cahn. Die Verdauung des Fleisches im normalen Magen. Zeitschr. f. klin. Medicin. Bd. xii. Heft 1 and 2.

† According to researches which I have made recently (Ewald and Gumlich. Ueber die Bildung von Pepton im menschl. Magen. Berliner klin. Wochenschr. 1890, No. 44), only very small quantities of genuine peptone are formed in the human stomach, the greater part of the products of conversion of albumen being propeptones (Kühne's albumoses). Therefore by "peptone" we must understand that product of albumen digestion which is not precipitated from neutral solutions by ammonium sulphate, rock salt (or concentrated sodium chloride solution), or salt-saturated acetic acid, but which gives the biuret-reaction, remains dissolved in the cold, and on heating is precipitated only by mercuric chloride, tannin, tungsto-phosphoric acid (phospho-molybdic acid), picric acid, and iodo-mercuric chloride. For practical purposes the statements in the text are sufficient, and we shall still keep to them.

The most important result of pepsin digestion is the solution of the solid albumen, proteolysis. The intensity of this process must be measured by approximate estimates, which depend upon the rapidity with which the coagulated albumen is dissolved. We will add a little coagulated albumen or fibrin to the stomach filtrate and observe the rapidity of its solution at the body temperature.

We slice a hard-boiled egg with a Valentin's knife into fine strips, and punch out with a cork-borer, or some similar hollow instrument, a number of pieces of equal size. These pieces are placed in glycerine, and then are at any moment ready for use. In order to determine in a given case whether hydrochloric acid or pepsin is in excess or deficient, four test tubes are filled with the filtered stomach contents, and one or two discs of albumen are placed in each. In one we put only the albumen, in another so much hydrochloric acid that the solution contains 0·3 to 0·5 per cent., a result obtained if we add to 5 cc. of stomach contents 2 drops of the acid. muriat. of the Pharmacopœia (Prussia). To the third we add a certain amount of pepsin, 0·2 to 0·5 grm., and to the last hydrochloric acid and pepsin. The tubes are now placed in a warm chamber, and it is easy to notice whether digestion occurs without the addition of acid and pepsin, or whether it is aided by the addition of hydrochloric acid or pepsin, or whether it is necessary to add both. On the other hand, also, if we still more strongly acidulate the filtered stomach contents, it proves whether the acid reaction was not already too strong. In this way we have a means of judging which factor of digestion is deficient. Still, it must be remembered that a certain percentage of peptone prevents or delays its further formation, so that an apparently prolonged test may in truth occur with good active gastric juice. We must not forget, not only in this but in all artificial digestive experiments, the great departure from the natural conditions caused by the absence of absorption and the emptying of the stomach into the intestine, by which the stomach keeps its contents at a certain uniform degree of concentration, so that our experiments take place under abnormal conditions, and, to a certain extent, are pathological.

---

[*] Part I., p. 94.

[†] Ewald. Ein Fall von Atrophie der Magenschleimhaut. Berliner klin. Wochenschr. 1886, No. 32.

Cahn. Die Magenverdauung im Chlorhunger. Zeitschr. f. physiol. Chemie. Bd. x. 1886.

In order to get over this difficulty, first Günzburg,* and then Sahli,† have invented a method which depends on the estimation of the rapidity of the absorption of iodide of potassium from the stomach (vide infra, p. 262) when it is introduced into the stomach in a capsule made of fibrin, which must be dissolved by digestion before the salt can be absorbed. Unfortunately, the time of absorption of iodide of potassium from the stomach is very variable within certain limits, and the stay of the capsule in the stomach, as Sahli has discovered, is very changeable, so that frequently, quite a short time after swallowing it, it passes unchanged into the bowel. Besides, the occurrence of the reaction must be within certain limits independent of the amount of free acid in the stomach, because, for example, it is found that where there is no free acid at all the reaction occurs without any evident delay. Therefore the conclusions which may be drawn from the occurrence of the iodine reaction in the saliva, as to the intensity of the digestion of albumen in the stomach and the amount of hydrochloric acid in the gastric juice, are not sufficiently accurate.

---

* Günzburg. Ein Ersatz der diagnostischen Magenausheberung. Deutsche med. Wochenschr. 1889.

† Sahli. Correspondenzbl. f. Schweizer Aerzte, 1889, p. 402, and 1891, p. 126.

Besides pepsin the gastric glands secrete the *rennet ferment*, which gives rise to the curdling of milk. We may recognise its presence by the following fact: a small quantity, about 10 cc., of boiled milk, having a neutral reaction, is mixed with an equal amount of exactly neutralised stomach filtrate and placed in a warm chamber; after a short time, on an average ten to fifteen minutes, the milk is coagulated, and separates into a mass of curd and clear serum. Besides the rennet ferment, or enzyme, there is, however, a previous stage, a pro-enzyme, or rennet zymogen, which by the action of acids, especially of hydrochloric acid, as well as by calcium chloride and heat, is converted into the typical ferment, but which has in itself no action on milk. It follows, therefore, that a stomach filtrate which causes spontaneously no coagulation of milk, or in which the ferment has been killed by the addition of alkaline carbonates, may coagulate milk after digestion with dilute hydrochloric acid, or after the addition of a five per cent. solution of calcium chloride. In fasting stomachs and in the beginning of digestion we can demonstrate the existence of the pro-enzyme only; later on we find the pro-enzyme and the enzyme present together. An acid reaction, or the presence of free acid in the original filtrate of the stomach contents, is not a necessary condition for the action of the rennet ferment, as it has been shown to occur without free acid, and even where the reaction was neutral.

I may specially mention Raudnitz, Boas, Johnson, and Klemperer, and recently C. Rosenthal[*] as having worked at the question of the rennet ferment in man.

Gentlemen, you know that *starch* is changed in the organism by the action of the salivary ferment, ptyalin, into grape sugar (dextrose), and that it forms out of cane sugar, as Leube has shown, invert sugar, a mixture of cane sugar and grape sugar. We know that this sugar-forming ferment is present not only in saliva, but that it is found in small quantities in very many tissues, and is probably contained in the mucus which is usually secreted in small amount by the stomach. It was formerly maintained that ptyalin acted only in the mouth during mastication, the so-called insalivation of the starchy material of the food. At any rate, gentlemen, the conversion of starch into sugar by the saliva takes place with extraordinary rapidity. But this is not sufficient to subject the food, which consists of more or less solid material, to the complete action of the ferment. The saliva is swallowed with it, and acts, as van den Velden* has shown, on starch in the stomach also. It is only a question how long this process lasts. We know that the sugar formation by the saliva occurs best in neutral or even in feebly alkaline fluids, but that the fermentative action is checked by acids. The formation of sugar ceases so soon as the solution contains acid, especially hydrochloric acid—which is of great importance—to the amount of 0·01 per cent. or more, whilst still smaller quantities of acid, on the other hand, occasion an increase in the action of the ferment (Chittenden). The acidity from lactic acid must be much higher, from 0·1 to 0·2 per cent., and from butyric acid or fatty acids still higher, as much as 0·4 per cent. Now, as has been shown by Ellenberger and Hofmeister in the pig and horse,† and by Ewald and Boas in man, the ingestion of pure starch excites the secretion of hydrochloric acid, which associates itself with lactic acid formed by fermentation. This takes place also with mixed starch-containing food. As now, under normal conditions, the stomach contents become more and more acid from the secretion of hydrochloric acid, we have a preliminary stage, in which starch is still converted into sugar; afterwards this process becomes more and more limited, until it at length ceases altogether. But in the conversion of starch into sugar we have not to do with a perfectly simple and plain process, but, as in the digestion of albumen, there is a series of intermediate products of dextrines and maltose.* The two most important dextrine bodies are erythrodextrine and achroodextrine. Maltose stands somewhere between starch and dextrine on the one hand, and grape sugar on the other.

---

[*] Raudnitz. Ueber das Vorkommen des Labferments im Säuglingsmagen. Prager med. Wochenschr. 1887, No. 24.—Boas. Labferment und Labzymogen im gesunden und kranken Magen. Zeitschr. f. klin. Medicin, Bd. 14, p. 249. —Johnson. Studien über das Vorkommen des Labferments, &c. Ibid., p. 240. —Klemperer. Die diagnostische Verwerthbarkeit des Labferments. Ibid., p. 280. —C. Rosenthal. Ueber das Labferment nebst Bemerkungen über die Production freier Salzsäure bei Phthisikern. Berl. klin. Wochenschr. 1888, No. 45.

---

* R. v. d. Velden. Ueber die Wirksamkeit des Mundspeichels im Magen. Deutsch. Arch. f. klin. Med. Bd. 25, p. 105.

† Ellenberger and Hofmeister. Arch. f. wissensch. u. prakt. Thierheilkunde. viii. p. 395, and xii. p. 126. Pflüger's Arch. Bd. 41, p. 484.

Now you know, gentlemen, that when we add a little iodine, or a solution of iodine and iodide of potassium, the so-called Lugol's solution of 0·1 iodine, 0·2 iodide of potassium, and 200 water, to a solution of starch, a deep blue coloration occurs. The more the starch is converted into dextrine or sugar the more this reaction is diminished. A solution of erythrodextrine becomes no longer blue, but, as the name implies, purple; achroodextrine, or maltose, or dextrose solutions only take on the yellow colour of the iodine solution. The latter bodies have a greater affinity for iodine than dextrine has, and this again than starch, so that a mixture of these on the addition of the first drops of iodine remains colourless, or is only transiently coloured, and only on adding more do we get the purple colour of erythrodextrine, or the blue coloration of starch.

As von Mering proved in the laboratory and I in man, in the saccharification of starch by ptyalin the smaller part is converted into dextrose and the greater part into maltose. The latter is converted in the intestine into dextrose (Brown and Heron).

Gentlemen, the practical consequences of these relations are:—

When the process of sugar-formation takes place normally in the mouth and stomach, within a certain time, mostly in the course of an hour, so much starch becomes changed into achroodextrine, or maltose and dextrose, that on the addition of a little Lugol's solution to filtered stomach contents no coloration takes place. If a purple coloration (erythrodextrine) or a blue coloration (starch) occurs it indicates a failure of sugar formation. This may depend upon deficient salivary ferment, or on a too rapid increase of acid, or on too much originally in the stomach.

If we are not able to make a trituration of the stomach contents —perhaps because we have too little—this serves as an indication of abnormal acidity in the stomach. We might perhaps suspect that under such circumstances the saliva was deficient, that the acidity was normal, but that the saliva did not possess sufficient fermentative power to convert the starch. This, gentlemen, does not appear to be the case. I have for a long time examined the fermentative power of the saliva in persons with caries of the teeth, with inflammatory affections of the mouth, angina, diphtheria, carcinoma of the tongue, &c., but I have never met with any saliva which could not convert starch, although I must admit that I have made no quantitative estimations. The saliva does not appear to lose its ferment, whilst pepsin appears to be occasionally absent, though only very rarely. Sugar is always present in the gastric contents after the test breakfast, as we give a certain amount of sugar with it.

---

* v. Part I., p. 46, et seq. See also the detailed account in Ewald, Ueber Zuckerbildung im Magen und Dyspepsia acida. Berliner klin. Wochenschr. 1886, No. 48.

There remain two points to be considered: (1) *the absorbing capacity of the stomach*, and (2) *its motor function*, two factors whose importance for the digestive function of the stomach has in recent times been unjustly undervalued, in favour of the purely chemical action.

The *absorption by the gastric mucous membrane* is proved by means of iodide of potassium. Following Penzoldt,* we give small doses, 0·1 grm., in capsules which are carefully wiped so that no iodide of potassium is on the outside, and we determine the moment when the salt first appears in the saliva by help of its well-known reaction on starch solution. Filter paper is soaked in starch solution, dried, and after the capsule has been taken, the saliva of the patient is tested with it from time to time, about every five minutes. On the addition of fuming nitric acid we can recognise at once, by the occurrence of the blue colour, the appearance of iodine in the saliva. As a rule it takes place in about ten to fifteen minutes. But where absorption from the stomach is delayed it may appear much later, from half an hour to an hour or more. I have had these data, which have been confirmed on different sides, tested by Dr. Boas, and I must declare, in opposition to J. Wolff, that when absorption is delayed until one or one and a half hours after eating, it is distinctly pathological. We have in this method an easy proof of the capacity of the gastric mucous membrane to absorb.

Another question is, *How can we test the motility, the motor function of the stomach?* The demonstration of normal peristalsis, the proper movement of the ingesta *in* the stomach and *out* from it, is very important, as it has been proved by a whole series of observations made in recent times, that a stomach which is more or less chemically disordered, whose chemical functions are abnormal, can still perform its digestive duties—I will not say completely, but very nearly—that the failure of the chemical function is compensated when the stomach contents pass into the intestine at the proper time, that is, when the motor power is intact.

---

* Penzoldt and Faber Resorptionsfähigkeit des menschlichen Magens. Berl. klin. Wochenschr. 1882, No. 21.

For the last three years I have watched a gentleman whom I have had an opportunity of examining several times each year, in whose stomach we have never found any free hydrochloric acid or pepsin. He goes every summer to Kissingen, gets relatively well, eats heavy dinners, works at his business—and yet I can only ascertain that pepsin and hydrochloric acid are uniformly absent at the most varied times after taking food, and after the most different kinds of food, after the test breakfast and after heavy meals. Dr. Wolff and I have published similar cases, one of a gastrotomised lady with cancer of the œsophagus,* and at the present time I could tell you of a number of such cases.

It follows therefore that the secreting function of the stomach is not necessary to life, provided that the disease of the stomach by itself cannot bring about any general systemic intoxication, and that under these circumstances the intestinal digestion can assume the whole burden of the work of digestion. This is intelligible because the arrangements for digestion are, so to speak, doubled: two secretions which digest starch, saliva, and pancreatic juice; two places where albumen is peptonised, the stomach and intestine; two secretions which participate in the absorption of fat, the bile and pancreatic juice—so that under certain conditions the intestine acts vicariously for the stomach. From other sources also similar considerations may be derived. Jaworski has, however, gone too far, in attributing a normally subordinate rôle to the stomach digestion, regarding it as nothing more than an antechamber and oven, which only serves to hold the ingesta and to pass them on into the intestine like a sluice.

---

* L. Wolff and Ewald. Ueber das Fehlen der freien Salzsäure im Mageninhalt. Berl. klin. Wochenschr. 1887, No. 30.—Ewald. Berl. klin. Wochenschr. 1887, No. 49. Verhandl. d. Vereins f. innere Med.

This is a far too exclusive view, which carries us back to the Hippocratic doctrine of the coction of food by the animal heat.

Hitherto we have possessed no practicable means for testing the motor function of the stomach. The test of the duration of digestion, employed by Leube, that is the proof whether, a definite average time of six or more hours after a heavy meal, or two to two and a half hours after Ewald's test-breakfast, the stomach still contains solid food, is liable to too great physiological variations to be of trustworthy diagnostic value. It involves absorption as well as motion. But the great practical objection is that it requires the passage of the stomach tube. Therefore I have suggested the employment of salol* for the estimation of the motor activity of the stomach. Salol is a compound of phenol and salicylic acid, a phenol-salicylate, which according to the statements of Nencki is not changed by acid fluids, but is split up by the action of the pancreas into salicylic acid and phenol. Gentlemen, the accuracy of this statement being granted, we have in salol a sufficient means, not only to determine how quickly, in a particular case, a body passes out of the stomach into the intestine, but also to recognise whether the function of the pancreas is normal, which hitherto has been quite impossible to do. From these points of view I undertook, with Dr. Sievers of Helsingfors, a series of experiments which proved on the one hand that salol splits up in even relatively feebly alkaline solutions, but on the other hand that it did *not* split up if introduced into the stomach when the contents were acid, or in acid gastric contents outside the stomach, or in artificial digestive mixtures of pepsin and hydrochloric acid. So soon as salol splits up into salicylic acid, phenol and the conversion product of salicylic acid, salicyluric acid, appearing in the urine, the salol must have passed from the stomach into the intestine.

Under normal conditions salicyluric acid appears in the urine forty to sixty or at latest seventy-five minutes after one gramme of salol has been taken, which is best given during digestion—longer delay indicates slowing of the transfer into the intestine. Salol is a tasteless white powder, and is easily taken. It may be ordered in capsules or employed in the form of keratin pills, but sometimes these pass undissolved through the bowel, and such pills may easily remain for varying and abnormal lengths of time entangled in folds of the gastric mucous membrane. The advantage of salol is that it mixes intimately with the stomach contents, and certainly accompanies its general movement. Salicyluric acid is easily recognised in the urine by the addition of neutral ferric chloride solution, which produces a violet colour. To detect the first traces the urine is acidulated with hydrochloric acid and shaken with ether; the salicyluric acid is taken up by the ether, and can easily be detected in the ether residue. More simple and no less certain is the plan of dipping a piece of filter paper into the urine and then letting a drop of ferric chloride fall on it. The edge of the drop becomes violet in the presence of the merest trace of salicyluric acid. Unfortunately this method is not exact, because it depends upon the part of the intestine in which the alkaline reaction is first met with; this must obviously depend on the varying reactions of the chyme as well as on the quantity of the bile and pancreatic juice, so that the salol has to make its way for varying distances down the intestine before it is split up. We (Ewald and Sievers) believed we could eliminate this circumstance by empirical estimation of the normal average time. But the constancy of this has been disputed from another aspect. Huber* has investigated in a somewhat different way the time during which salicyluric acid is excreted in the urine after taking salol. In healthy persons this continues for twenty-four hours, in patients with enfeebled motility of the stomach for forty-eight hours, and even longer, so that by examining the urine we should be able to get valuable results, if it were not that we are unable to distinguish with certainty what is due to intestinal absorption and what to the processes in the stomach. At any rate we may learn, if we have been careful to ascertain the acidity of the stomach contents, by one way (Ewald) or the other (Huber) whether the passage from the stomach into the intestine is free, and this may be of great importance. An inquiry by Silberstein,† made in Senator's wards, into the value of Huber's modification, arrived at favourable results, in opposition to the earlier reports of Pal and Decker.* In twenty-six cases of dilatation of the stomach, and in twelve cases of atonic enfeeblement of the muscular wall of the stomach, compared with experiments on healthy persons, the excretion of salicyluric acid lasted till the second day, that is, for thirty or more hours. The state of the bowels (constipation or diarrhœa) appeared to be without influence upon this duration. Therefore it is recommended to give one gramme of salol and to examine the urine thirty hours afterwards. If the result is positive, an affection of the movement of the stomach is shown to exist with as much certainty as a single test respecting an organ specially liable to nervous influences can rightly afford grounds for a diagnosis. If the result is negative, the total urine excreted between the thirty-sixth and forty-eighth hours must be examined.

---

* Sievers and Ewald. Zur Pathologie u. Therapie der Magenectasien. Therapeut. Monatshefte v. Liebreich, Langgaard, u. Rabow, Aug. 1887.

---

* A. Huber. Münchener med. Wochenschr. 1887, No. 19. Zur Bestimmung der motorischen Thätigkeit des Magens.

† Silberstein. Zur Diagnose der motor. Insufficienz des Magens. Deutsche med. Wochenschr. 1891, No. 9.

It will be objected that salol cannot be decomposed in the stomach, but that it may be taken up in substance into the blood, there decomposed, and then excreted. But we have taken this objection by the forelock, as we have tied the pylorus of a dog with a double ligature and then administered salol, without finding any trace of salicylic or salicyluric acid in the urine up to the time of death—he was killed after three hours. This is a proof that salol is not absorbed by the stomach.

Klemperer † has suggested another method for estimating the motor activity of the stomach. He pours a definite quantity (100 cc.) of pure olive oil into the empty stomach, which is previously washed out, and after two hours he aspirates the residue left behind in the stomach, which may be withdrawn completely with only insignificant loss. The difference between the amount poured in and the oil withdrawn is the measure of the motor work performed by the stomach in the meantime. However, Klemperer regards his method as not generally practicable, as it is too prolonged and too disagreeable to the patient. But it might serve to ascertain certain types of motor insufficiency which are so characteristic that they do not require the help of any pouring in of oil to enable us to recognise them. How far this object is attained the future will show; at any rate, his results, so far as they show the influence of certain drugs on the stomach movements, are in complete accordance with the results of the salol method.

---

* Pal. Wiener klin. Wochenschr. 1889, No. 48.—Decker. Berl. klin. Wochenschr. 1889, No. 45.

† Klemperer. Ueber die motorische Thätigkeit des menschlichen Magens. Deutsche med. Wochenschr. 1888, No. 47.

Finally, it may be remarked that the admixture of bile with the stomach contents may be sometimes recognised directly by its green colour, and in other cases by means of Gmelin's test. It is also characteristic of bile if the yellow-coloured pap which remains on the filter after the test breakfast turns green at the edges by oxidation after standing a long time exposed to the air.

With this, gentlemen, we have exhausted the list of chemical methods for examining the diseased stomach. Their significance for the diagnosis and treatment of diseases of the stomach will appear most plainly in what follows. So far, as you could see from my introductory remarks, I am far removed from a one-sided over-estimation of their value, but I dare to hope in the future that there will be many valuable additions to our knowledge from this recently inaugurated study.

The so-called physical examination, the second great group of diagnostic means, can be here only so far described as there are specific peculiarities in the examination of the stomach, or it is employed in a particular way. We shall have opportunity, in studying individual diseases, to go into the questions of percussion, auscultation, inspection, &c., so that I will consider only three technical methods.

1. *Palpation.*—Among the various means of exploration for examining the abdominal cavity this plays, doubtless, the chief part. He who can palpate well, and has a delicate sensibility in his finger tips, has an advantage in diagnosis which cannot be over-estimated.

It is true that it is a combination of tactile sensation and mental process, by which, in an instant, the observer draws upon the whole of his past experience and applies it to the present case; it is this which, if I may venture on so bold a figure of speech, enables him to see through the abdominal wall and controls his fingers. This was the case, for example, with Frerichs, who possessed an extraordinary accuracy and mastery of palpation, and who was certainly in a great degree assisted by the latter factor, that is, by his great experience. But there is much to be done by proper technical methods, and as I see daily that these are not understood, and that the examination of patients is thereby made more difficult and less certain, you will pardon me if I draw your attention to two very well-known points. Never palpate with the hand held at right angles or obliquely to the abdominal wall. Proceed slowly and cautiously by small rotatory movements from the surface to the deeper parts. Lay the hand flat on the abdominal wall, and also press downwards by bending the terminal phalanges with a gradual gentle pressure. Not only will you avoid the contractions of the abdominal muscles, whose edges may lead quite experienced investigators into error and uncertainty, but we have certainly in this way a more delicate touch for the seat, size, and shape of anything found under the abdominal wall, and last, not least, the patient is spared the slightest unpleasantness or pain. It is the same with percussion. With light percussion slight differences are audible which are lost with strong percussion. Under certain circumstances, no doubt, stronger palpation and harder percussion may be necessary, as we need scarcely say, but these are not the ordinary cases. It is very advantageous to complete the palpation made on the back or the side by placing the patient in the knee-elbow position. Movable tumours fall down towards the anterior abdominal wall, and can then be felt.

2. *Inflation of the stomach and intestine with air.*—The plan of inflating the stomach by means of carbonic acid gas formed *in loco*, was introduced by v. Frerichs, and since has become general among physicians. This has been extended by von Ziemssen* to the intestine, after the American fashion, by introducing into it sodium bicarbonate and some organic acid, but it is also possible to use carbonic acid gas formed outside the body, for example, by means of an inverted soda water syphon inserted into the rectum (Schnetter †).

These procedures have the disadvantage that we cannot control the amount of carbonic acid gas to be developed, and that frequently other symptoms are caused by the irritation of the gas on the walls of the stomach or bowel, and that we cannot at pleasure regulate the tension or increase it, although different processes require very varying quantities. On these grounds the plan recently recommended by Runeberg[*] and Oser[†] and long practised by me, of pumping in air through a stomach or anal tube, by means of the bellows of a spray apparatus is far better. As in these cases there are usually other reasons for introducing the stomach tube, there is no need for its special introduction, and in any case the discomfort of it is not so great as to be a serious objection. Runeberg very truly says: "If, for example, it is desired to define the size and position of a greatly dilated stomach, it is not so easy to produce extreme distension of it by developing carbonic acid gas within it. While, on the other hand, this can be done at once, and without any difficulty, by pumping in air." The same holds good for the intestines, especially for the transverse colon. The excess of air pumped into the stomach escapes by the side of the tube, or is easily got rid of by the contractions of the stomach so soon as the patient feels the distension too great. But in distension by carbonic acid the gas causes a spasmodic closure of the cardiac orifice, so that very great efforts on the part of the patient are required to overcome it. Moreover, the pylorus gives way first, and the gas passes into the small intestine. The condition described by Ebstein as insufficiency of the pylorus, in which the gas passes rapidly into the duodenum, is one I have never observed, and I believe that the pylorus only gives way in consequence of the development of the carbonic acid gas. Schütz,[‡] it is true, has had a contrary experience, and it appears to me that in some exceptional cases, not parallel to the experiences of Oser[§] and myself, the air passes quickly into the intestine. It is possible to combine the inflation of the stomach with that of the intestine. Behrens[||] has drawn attention, not long ago, to the value of this method in the recognition of tumours in the abdominal cavity. According to my experience the quantity of air required to be pumped in *per rectum* varies very much in individuals, and as variable also is the significance of visible distension of the coils of intestine. But it has seemed remarkable to me, and it appears to be the rule, what large quantities of air can be pumped in without any escaping *per anum*, provided that no serious constipation exists. In the latter case, and where there are strictures and stenoses of the lower portion of the bowel, the air escapes rapidly mixed with foul intestinal gases. I have recently entirely confirmed these statements in a case of compression of the descending colon by a new growth.

---

* von Ziemssen. Die künstliche Gasaufblähung der Dickdarms zu diagnostischen und therapeutischen Zwecken. Deutsches Arch. f. klin. Med. Bd. xxxiii. p. 235.

† Schnetter. Zur Behandlung der Darmverschliessungen. Deutsches Arch. f. klin. Med. Bd. xxxiv. p. 638.

---

[*] W. Runeberg. Ueber künstliche Aufblähung des Magens und des Dickdarms durch Einpumpen von Luft. Deutsches Arch. f. klin. Med. Bd. xxxiv. p. 460.

[†] Oser. Die Neurosen des Magens. Wien. 1885, p. 10.

[‡] E. Schütz. Wanderniere und Magenerweiterung. Prager med. Wochenschr. 1885, Jan. 14.

[§] Oser. Die Ursachen der Magenerweiterung. Wiener med. Klinik. 1881, p. 4.

[||] O. Behrens. Ueber den Werth der künstlichen Auftreibung des Dickdarms mit Gasen und mit Flüssigkeiten. Göttinger Inaug.-Dissert. Helmstädt, 1886.

3. Very similar, though more complicated to carry out, is the method suggested by Piorry, but made better known by Penzoldt,* to fill the stomach with water, so as to define its lower limits by means of percussion, provided that the transverse colon contains air, and it is possible by pouring in large quantities of water to guard against confounding it with dull sounding neighbouring organs, tumours, &c. I shall return to the conclusions to be drawn from these experiments, and a modification recommended by Dehio, in discussing dilatation of the stomach.

4. *The deglutition sound as a diagnostic means.*—I have treated of the nature and value of the deglutition sound in Part I. of these lectures, and have explained that it affords no basis for diagnosis in diseases of the stomach. In opposition to the opinion of Meltzer,† that it involves relaxation of the cardiac orifice, and occurs as a symptom of old standing syphilis, phthisis with easy vomiting, neuroses of the cardia, &c., Dirksen‡ and I have shown the inconstancy of this sign. I have not found a constant and characteristic change in the intensity or the tone of the murmur, either in paralytic spinal diseases, or in dilatation of the stomach, or in any other of the diseases stated to involve such changes. On the other hand, *absence of the sound is typical and characteristic* of complete, or nearly complete, closure of the cardiac orifice, whether from the œsophageal or gastric side. Still, it is necessary to ascertain by repeated examination the constancy of this absence, as it may be absent occasionally even in healthy persons. Finally, gentlemen, we have still a special method of examination inaugurated by the labours of Mikulicz, which permits a direct view of the gastric mucous membrane by means of a specially constructed gastroscope, that is, *gastroscopy*.

---

* Penzoldt. Die Magenerweiterung. Erlangen, 1877.

† Meltzer. Schluckgeräusche im Scorbiculus cordis und ihre physiologische Bedeutung. Centralbl. f. d. med. Wissensch. 1883, No. 1.

‡ D. Dirksen. Beitrag zur Lehre von den Schluckgeräuschen. Inaug-Dissert. Berlin, 1885.

Unfortunately the literature of the subject is exhausted with the name of this author, as the gastroscope constructed by Leiter is so expensive, and its use so difficult and requiring so much practice on the part of both patient and physician, that it has not obtained any wider adoption. But the data which Mikulicz* obtained in carcinoma of the pylorus are diagnostically interesting. In the normal stomach the pylorus appears as an oblong slit or a three-cornered, oval, or circular opening, which is surrounded by a crown of vivid red folds of mucous membrane which show lively movements and constant changes of form. On the other hand, when the pylorus is the seat of a new growth this region is smooth, pale, without any folds and quite motionless, so that there would be in this a good diagnostic sign, if Pribram† had not found in a case of pyloric cancer—but without gastroscopic examination—lively movements of the tumour, that is, an enlargement and subsidence of it occurring synchronously with active contractions of the stomach as a whole. Whether the gastrodiaphane, suggested by Einhorn, of New York,‡ that is, a small electric lamp introduced into the stomach which makes the stomach transparent, will prove practically useful remains to be seen. In animals a similar experiment was performed by Milliot as long ago as 1867.

Gentlemen, just two words on the methods of treatment in stomach diseases.

Respecting the methods which from time to time have been suggested for *washing out the stomach or irrigating the gastric mucous membrane*, the best is the simple plan of syphoning, of which, as of "expression," we can say, *Simplex veri sigillum*. The free end of the stomach tube is connected with a glass funnel by means of an india-rubber tube about a metre in length, and by raising and lowering the funnel the fluid is poured into the stomach and withdrawn. As, with few exceptions, the washing out is performed at such a time after eating that there is no danger of the openings in the tube being stopped up, and as little pieces of meat or suchlike if sucked into the holes are easily driven out again by the pressure of the water when the funnel is held up, the simple syphon action succeeds completely. I consider it quite irrelevant whether we irrigate the mucous membrane with a continuous stream through a tube *à double courant*, or repeatedly fill and empty the stomach, indeed I might say there is some advantage in the latter, as by rapidly raising and lowering the funnel the fluid in the stomach is made to move more rapidly, and thereby the mechanical removal of mucus and solid particles which cling to the folds of the mucous membrane is facilitated. I have a large glass funnel holding two litres, and 20 cm. in diameter, which is connected with an india-rubber tube of the required length, over the lower end of which the stomach tube passes. The funnel rests in a wooden stand (fig. 3) on the floor, and is filled with the required amount of water or other fluid, and is then elevated to different heights according to the force with which we wish to pour in the water. The water rushes through the openings of the tube in the stomach like a rain-douche, so that by slight alterations in its position it is possible to douche the different parts of the stomach wall. To withdraw the water the funnel is replaced on the stand, when some particles from the stomach rise into it, which may be easily removed for future examination. This method is much more handy and quicker than manipulating with a small funnel, especially when one has no assistant at hand. For consulting

---

* Mikulicz. Wiener med. Wochenschr. 33 Jahrg. p. 748.

† Pribram. Zur Semiotik des Pyloruscarcinoms. Prager med. Wochenschr. 1884, p. 53.

‡ M. Einhorn. Die Gastrodiaphanie. New Yorker medic. Monatschr. November, 1889.

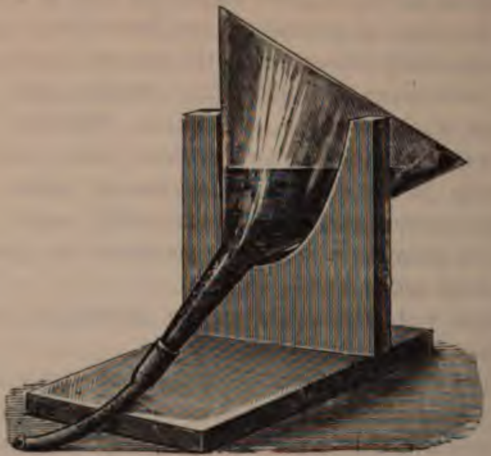


Fig. 3.

practice away from home I have a small gutta-percha funnel holding about 300 cc.

The patient cannot perform this operation by himself. But in many cases it is ordered that the patient should wash out his own stomach, for which, naturally, the first condition is that he should introduce the tube himself, a manipulation which most patients learn to perform very quickly. Here we succeed with the simplest methods. For syphoning, the stomach tube is connected with a T-shaped tube, one limb of which is attached to a tube with a gutta-percha stop-cock in it and connected with an irrigator, the other limb is provided with an india-rubber tube about one metre in length. The patient seats himself near the irrigator, which is filled and hung up at a convenient height, closes the tap, introduces the tube, compresses with his fingers the exit tube, while with the other hand he opens the tap of the irrigator, and by alternating pressure on one or the other tube he regulates easily the introduction or withdrawal of the fluid without further help. Many patients attain to great facility in this operation, and cannot practise it too often, so that they end by abusing it. Literature, especially French literature, contains a great number of such cases.

The electrisation of the stomach may be employed either by placing both electrodes externally upon the abdominal wall, or one electrode may be introduced into the stomach and the circuit completed by the other, which must for well-known physical reasons have a diameter as large as possible,* placed on the wall of the abdomen. Einhorn has recently suggested a convenient apparatus for a stomach electrode, which consists of a gutta-percha capsule the size of an almond perforated with several holes, within which is the metal electrode. The latter is provided with a copper wire rheophore insulated by gutta-percha. The figure (fig. 4) shows the instrument of its natural size. The capsule is swallowed after drinking one or two glasses of water and the rheophore is connected with one pole of the battery, while the circuit is completed by a flat electrode on the abdominal wall. In employing this electrode I have observed the disadvantage that it is very difficult to swallow, and that it is apt to stick in the œsophagus; I have therefore passed the rheophore through a tube of soft india-rubber of the thickness of a Nélaton's No. 20 catheter. This little instrument has sufficient rigidity to be easily introduced into the stomach, and is yet slim enough not to be too disagreeable to the patient for it to remain *in situ* for some time. Before the introduction I let the patient drink one or two large glasses of water, or fill the greatly dilated stomach with water by means of a tube. The intraventricular application of the current is explained as insufficient by von Ziemssen*, because the electrode always lodges on the left side of the great curvature as it is bent in this direction, that is, towards the left iliac region, by the inclination of the axis of the œsophagus to the left, so that a general action on the entire organ cannot be obtained, and that also, apart from this objection, the procedure is too exhausting for enfeebled patients to support. However, the entering current must be broken up in all directions by filling the stomach with water, and is conducted to the stomach wall, so far as it is under water, whilst the difficulty about the feebleness of the patients is removed by the fact that it might be used mostly in strong persons, and that the experience of von Ziemssen appears to have been formed at a time when the intraventricular electrisation of the stomach had not reached the level of the methods of to-day, and was much more wearying and trying to the patient than it now is.

---

* Vide C. Rieger. Grundriss der medicinischen Elektricitätslehre. Jena, 1887.

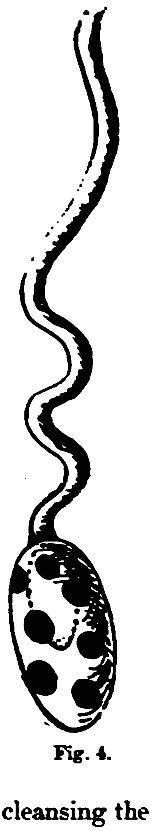


Fig. 4.

Finally, we can introduce an electrode into the stomach and a rectal electrode into the rectum previously cleansed by an enema, and apply the electrical current to the entire length of the intestinal canal.

Schillbach † has performed some such experiments on rabbits, but, as it seems, without previously cleansing the bowel. I have seen in man quite surprising results in some cases of torpid bowels, combined with slight dilatation of the stomach; in others no special effects have followed.

---

* von Ziemssen. Ueber die physicalische Behandlung chronischer Magen-und Darmkrankheiten. Klinische Vorträge. xii. Leipsic, 1888.

† E. Schillbach. Studien über den Einfluss der Elektricität auf den Darm. Virchow's Archiv. Bd. cix. p. 284.

As to the possibility of influencing the stomach by means of the electrical current, there are a series of investigations, for example, those of von Ziemssen and Caragiosiadis,[*] Bocci,[†] and others. The external application of the electrodes only causes slight contractions of doubtful therapeutic value, which, with the constant current, are limited to local twitching. The induced current, at least when applied directly to the gastric mucous membrane, has more effect, and, as Bocci proved in the case of a dog with a gastric fistula, it is followed by the secretion of gastric juice or mucus. According to von Ziemssen,[‡] the secretion of gastric juice is increased in dogs by strong currents of both kinds. Reynard and Loye[§] have observed the same phenomena in an executed criminal, in whom they performed electrical excitation of the vagi forty-five minutes after death. The experiments carried out by Sievers and myself[||] showed distinctly that it was quite possible to produce a distinct effect on the stomach by faradising the abdominal wall by means of strong currents and broad flat electrodes. Salol (vide supra, p. 264), in experiments performed with this object, was in many persons constantly excreted earlier than usual, and must have been passed into the intestine thus early in consequence of stronger contractions of the stomach.

On the clinical side there are quite a number of favourable facts for the constant, and especially for the induced current recorded by various well-known observers, Kussmaul, Leube, Fürstner, Burkart, and others; and Ziemssen praises it in the places quoted, especially when the percutaneous electrisation of the stomach is performed with large electrodes of 500 to 600 sq. cm. and strong currents. A short electric brushing of the skin of the abdomen, chest, and back of two or three minutes' duration is a method which is followed by a feeling of warmth and freshness and a striking improvement in appetite, as well as by a distinct increase in the active digestive capacity of the stomach, which I can confirm to be not unfrequently the case, for example in patients with nervous anorexia, who, after electrisation, eat with appetite and digest relatively well. I can also add that there is a favourable action on the stools, but unfortunately I must lay more stress on the words "not seldom" than von Ziemssen does; that is, I must complain of the inconstancy of the results to be observed in percutaneous electrical treatment, all the more as Pepper,[*] in a case of cancer of the pylorus, with dilatation and distinctly visible peristalsis, could obtain no excitement of the latter either by the faradic or the constant current, but only contractions of the abdominal muscles. There is a better chance of succeeding by the use of internal electricity with the electrode of Einhorn, or my modification of it, and I use it now in cases of dilatation of the stomach with fairly good results. Baraduc[†] speaks very highly of the value of "electrisation intrastomacale" and "la galvanisation du grand sympathique au cou" in diseases of the stomach.

---

[*] Caragiosiadis. Die locale Behandlung der Gastroectasie mit dem elektrischen Strom. Inaug.-Diss. Munchen, 1878.

[†] Bocci. Elettricita nello stomaco dell' animale e dell' uomo. Lo Sperimentale, 1881, p. 561.

[‡] von Ziemssen, loc. cit. [§] Quoted by von Ziemssen, ibid. [||] Loc. cit.

This is the place to mention gymnastics of the abdominal organs, especially *massage of the stomach* and *hydropathic procedures*. But apart from the simplest processes of hydrotherapeutics, the wet frictions, packs, hip-baths, and wet packs with and without the douche, which are the domestic applications of the cold-water treatment, the methodical employment of this treatment, especially in combination with electricity, for example, electrical baths, requires special guidance and apparatus, which can be only found and properly used in a special institution. I would also advise that massage should, wherever possible, be undertaken only by a properly trained person.

Finally, gentlemen, I cannot leave these remarks on our methods without adding that the recognition of the service which the aniline dyes can perform for us in detecting free acids, especially hydrochloric acid, and also of the clinical importance of these reactions, is due to two French observers, Laborde and Dusart, who as long ago as 1874 published their "Nouvelles recherches sur l'acide libre du suc gastrique," and employed at first aniline sulphate with peroxide of lead, and later (1877) methyl-violet. This fact was recognised at the time, that is, in 1879, by van den Velden,[‡] and has never been disputed, so that the claim for priority, lately put forward by Laborde,[§] is incontestable.

---

[*] Pepper. A case of scirrhus of the pylorus, with remarks on the electrical excitation of the stomach. Philadelphia Medical Times, May, 1871.

[†] Baraduc. Journ. de la société scientifique, 1891, No. 10, p. 97.

[‡] van den Velden. Deutsches Arch. f. klin. Med. Bd. xxiii. p. 374.

[§] Laborde. Les colorants appliqués, &c. Bulletin gén. du Thérapeutique, 1887, 30 Janv.

LECTURE III.

ON STENOSES AND STRICTURES OF THE CARDIAC ORIFICE.

GENTLEMEN,—The obstacles which prevent the entrance of food into the cardiac opening or mouth of the stomach, may (if we except the stoppages which are liable to occur higher up, in the mouth, the pharynx, and the œsophagus, and relegate acute cases, such as the swallowing of foreign substance, bones, &c., to the care of the surgeon) be traced to three distinct causes: *spasmodic contraction, cicatrices, and new growths* which form in the part in question. The last are never confined exclusively to the cardiac ring, but extend in a greater or less degree upwards into the œsophagus, or downwards in the walls of the stomach.

The symptoms to which these conditions give rise bear a strong likeness to each other, in spite of the great variety of causes which may be at the root of them. The original evil which causes the group of symptoms is the inability to pass into the stomach the nourishment which has been taken. The passage through the cardia is in most cases gradually obstructed. In the beginning there will alternate periods, during which no hindrance is felt to exist, with others when the patient distinctly feels that the food "lies like lead upon his chest" and has not entered his stomach, but in the course of time, by drinking and repeated efforts to swallow, the abnormally narrowed passage at length is passed. At this stage fluids and very soft food usually cause no feeling of discomfort, the stoppage will be greater in proportion to the size and solidity of the food taken, so that a piece of meat, or such-like substance, which has been swallowed in haste without proper mastication will cause for the time a complete block, impassable even for fluids. Later on the times during which no inconvenience is felt become rarer and rarer, the necessity for taking nourishment in the form of fluid becomes more and more urgent, and the choice of food more limited. Then, as a fresh symptom, appears vomiting of food, which comes up unchanged except that it is mixed with [illegible] proportion as the stoppage [illegible] taken will collect before the [illegible] liable to be sent back again [illegible] œsophagus contract peristaltically, [illegible] through coughing, &c. Consecutive dilatation of the œsophagus may be a further result, and [illegible] occasionally a slight expansion [illegible] œsophageum, called by [illegible] existed since birth. Von Ziemssen and Zenker* are certainly right in their remarks that these dilatations are not found in practice nearly so often as the text-books would lead us to expect. But the question is, What is understood by dilatation? And when the above-named authors quote a case of dilatation of the œsophagus with an average of 5 cm. at the widest part of the dilated viscus, I can quote to them two instances in cases of stricture of the cardia, in which the widest part of the œsophagus lay 5 cm. above the cardia, and measured 6·2 or 6 cm., while further up it was only 3 cm. But looked at anatomically, neither case could take rank as well-defined dilatation of the œsophagus.

So far as space will allow, the ingesta collect in the œsophagus before the entrance to the cardia till the wall is so highly irritated that the food is brought back by a fit of coughing. At first this happens only after meals, but in the later stages of the disease choking and vomiting may occur at a time when no food has been taken. At first, too, all is not brought back, the contents of the œsophagus being only pressed up a certain distance to sink again later after fluid has been passed through the obstructed part. Later on larger quantities are ejected, as is easily understood by Brinton's† explanation that through the normal peristalsis of the œsophagus, which runs from above downwards, and compresses its contents, an axial layer is forced upwards exactly as in the case of a pump or syringe piston with a hole bored in its centre.

The ejected matter consists of the ingesta in an unchanged condition, except that they are mixed with mucus and saliva. Chemical examination fails to discover any traces of the digestive action of the stomach, while an examination with the microscope sometimes reveals the specific elements of a morbid growth. When no colouring fluids (such as red wine, fruit juice, strongly coloured medicine, &c.) have been taken, the ejected matter is generally of a grey-white or grey-yellow colour, without any traces of admixture of bile. I must call your attention particularly to this latter point, for the absence of the bile-colouring matter may be of the utmost importance in cases where it is necessary to decide whether the ejected masses are really the contents of the œsophagus, or whether they are the contents of the stomach—a question which it is not always easy to decide. As an exception to the general rule, food taken at an earlier meal is sometimes ejected, while no traces can be found which distinctly characterise that last taken. As this is known to be a usual and easily explained occurrence in cases of diverticulum of the œsophagus, the observation of this fact might serve as a diagnostic of diverticulum, or at any rate cause us to suspect its existence. But to show that we must not rely implicitly on the testimony thus gained, I may mention two instances in which I made a *post-mortem* examination in stenosis of the cardia accompanied by dilatation, but not by any diverticulum of the œsophagus, in which this symptom was repeatedly observed, causing a perpetually recurring suspicion of the existence of a diverticulum *intra vitam*, but in which, as I said before, the œsophagus was found to be entirely free. The above-named symptom is not, therefore, a convincing diagnostic proof of the existence of a diverticulum. It probably occurs only during certain stages of the growth of the stricture, in which some kinds of food pass through more quickly than others.

---

* v. Ziemssen and Zenker. Œsophaguskrankheiten in Handbuch der Krankheiten des chylopoëtischen Apparates, I. S. 88.

† W. Brinton. Lectures on the Diseases of the Stomach. London, 1864, p. 10.

A further consequence of the obstructed passage of food, which keeps step with the increasing constriction of the *foramen cardiacum*, is the disturbance and check given to the supply of nutriment received by the patient, which produces at last a high degree of emaciation and debility. The abdomen is concave, the epigastric and hypochondriac region more so than any other; the pulsation of the aorta may be most distinctly felt; muscle and fat have more or less disappeared; the colour of the skin is pale and waxy, or tinged, particularly in the face, with the greenish yellow tint especially characteristic of the cancerous cachexia. The eyes are sunk, the lips drawn together, and the bones of the nose and cheeks are unduly prominent. The tongue has a thick white coating, and in spite of the most careful cleansing of the mouth, *fœtor ex ore* occurs. The action of the bowels is feeble and infrequent, and the fæces hard, dry, and like those of a sheep, the urine infrequent with little solid matter —in one instance I was hardly able to discover any remaining traces of chlorides—and in the later stages of the disease containing now and then a certain amount of albumen. Œdema of the ankles and slight œdema of the legs usually make their appearance towards the end of the malady.

The symptoms here described are much influenced and may be greatly varied, both by the original cause of the malady, and by the constitution of the patient, and this is more especially the case when there is spasmodic contracture, where the symptoms may be most grave and serious, without, however, leading to the worst results. But in cases of organic stenosis, the amount of obstruction in the œsophagus, and the general health of the patient, do not always stand in direct relation to each other. I have repeatedly seen cases in which the stricture was of the most serious kind, yet in which the patient, although complaining of some decrease in strength, neither looked nor felt so ill as might have been expected. On the other hand cancer of the cardiac orifice giving rise to cancerous cachexia, which may be looked upon as the result of constitutional intoxication, may reach an advanced stage, without producing a corresponding contraction of the opening. It is, however, a peculiarity of cancer in this position that its reaction on the general organisation, in as far as it shows itself by metastasis, swelling of the glands, &c., is comparatively slight.

During the course of the malady, local or more generally diffused pains do not take a prominent place among the symptoms. Cardialgia proper, that is to say, violent cramp-like pains which localise themselves in the epigastric region, is absent, also the violent shooting pains which so often accompany carcinoma and ulcers of the stomach, are generally absent too, and when present give rise to the suspicion that the malady is not confined to the cardiac end. In most instances the patient complains of a slight burning or boring pain, or sometimes only of a feeling of weight in the region of the ensiform cartilage, which feeling may occasionally in the minority of cases be increased by external pressure on the point of the ensiform cartilage, but which is, as a rule, not increased by the act of swallowing. One patient complained of pains in the back when the cancer had affected the retroperitoneal glands. In many cases there is no pain at all.

With your permission, gentlemen, I will now bring before your notice a case of stenosis of the cardiac opening, and discuss at the same time the diagnosis and therapeutics of it.

Mr. P. is the keeper of a restaurant; he is a large-boned man, forty-eight years of age, whose appearance at once shows that he has wasted away in a comparatively short time. His face is not very thin, but the size of his clothes proves that they were made for a far larger man than he is at present. In fact, he states that during the last ten weeks he has materially decreased in size, in consequence of ever increasing "stomach disorder" which has greatly debilitated him. Without any preliminary symptoms, he became aware after eating that the food stopped in his chest "as if a cork were there," and this feeling continued until he relieved the stomach by vomiting. At first, as I have already mentioned, this happened only after meals, but during the last few days it has occurred at other times also. Fluid or soft food is more easily retained, but a part of this also is vomited. The ejected matter is always in much the same condition as when swallowed, except that it is mixed with large quantities of thick mucus. He complains neither of pains nor of eructation. Appetite good. Action of the bowels languid, but kept up by means of aperients. In the last few days a great feeling of weakness has come on; the patient passes the greater part of the day lying down.

No case of cancer has appeared in the family. His father died of an apoplectic attack, his mother is still alive. The objective examination of the patient yields an entirely negative result; the abdominal walls are slightly hollow, percussion proving that neither the stomach nor the neighbouring organs, liver, spleen, or intestines, have reached an abnormal size. Palpation also does not lead to the discovery of a tumour or any other abnormal growth in the abdominal cavity. We apparently find the great curvature 2 cm. above the umbilicus traversing the median line. But the inflation of the colon from the rectum, which, as you see, I effect by means of the bellows of a spray apparatus, shows that the transverse colon projects directly under the arch of the ribs, and that in consequence it is impossible for a dilatation of the stomach to exist. The œsophageal tube passes easily into the introitus œsophagi and through the whole length of the œsophagus, but after having been introduced to the length of about 44 cm. is stopped by an obstruction, as if it were pushed against the bottom of a sac. During this process the patient ejects large quantities of white mucous fluid mixed with pieces of tough hyaline mucus; he has no pain, but he suffers much from the choking sensation caused by reflex irritation. All efforts to pass the tube any further are useless, in spite of our having made the attempt with tubes of different sizes down to the thickness of a fowl's quill. We have also tried placing the patient in different positions, and have caused him to lie on the right or left side, or to rest upon his knees, but without producing any better results. This latter position has been made use of by us in order to try once more palpation of the abdomen, but we still fail to discover any abnormal condition.

The examination of the ejected fluid, which amounts to about 100 cc., gives the following result. The reaction with blue and red litmus paper is neutral, tested with iodine it gives a light red colour like Burgundy, and has a slightly diastatic action; it contains small quantities of lactic acid, but is completely devoid of peptone and pepsin. After acidulating with hydrochloric acid, the fluid, when put in a warm place with albumen, has still no digestive action. You see here the test in question, in which the added albumen lies at the bottom of the test tube, and the biuret-reaction gives negative results.

Under the microscope we find, together with numerous grains of starch, tinted blue by the action of iodine, some muscular fibres quite intact, and numerous fat cells of different sizes. Schizomycetes, in shape like little rods, are to be found, although not in great numbers. On the other hand, saccharomycetes, sarcinæ, and cellular elements which might be derived from some kind of tumour are absent. The patient states, that about three hours before the examination, he took some milk, and a short time before that, a small quantity of finely chopped meat. Deglutition sounds are not to be heard by auscultation over the scorbiculus cordis, neither a first nor a second sound being present, but on the other hand, the fluid may be distinctly heard to descend in the act of swallowing, without, however, the special sound, the so-called stenosis sound, as if the fluid were pressed through a contracted place, being audible. In view of these results there can be no doubt that we have to deal with a case of stenosis of the cardiac orifice, and consecutive dilatation of the œsophagus above it. This is proved not only by the matter brought up through the tube, and the negative result of all examinations made in the stomach, but also by the results given by chemical examination.

The space between the cardiac orifice and the incisor teeth, with reference to the length of the œsophagus, of course varies with the size of the individual. The average length is given as 40 cm., divided into 15 cm. between the incisor teeth and the upper part of the œsophagus, 5 cm. for the length of the throat, 17 cm. for the chest, and 3 cm. for the abdomen. I have frequently found the length to be greater, extending to 47 and 48 cm. in all According to these measurements the 44 cm., which is the length to which we can pass the tube without obstruction, corresponds, in the case of a large man, such as our patient, with the length of the œsophagus, added to that of the mouth and pharynx, and shows that the tube is stopped at the cardiac orifice.

With your permission, gentlemen, I will now give a few practical hints on sounding the œsophagus.

For this purpose, either the so-called œsophageal probang, the solid sound, or the œsophageal tube may be used. The first is a small sponge, about the size of a hazel nut, fastened to a straight or slightly bent whalebone stem, with which, if the whalebone is long enough—the manufacturers generally make them much too short—the œsophagus may be swept to a certain extent, the various obstructions ascertained, and threads of tissue which may adhere to the meshes of the sponge may be brought up for examination. The probang has this disadvantage, that in the case of a patient with a narrow œsophageal opening or extreme sensitiveness of the constrictor muscles some force is necessary to pass it into, and particularly to draw it out of the œsophagus, because it is liable to stick so fast at the entrance (or in another sense exit) of the œsophagus, or at a particular spot behind the larynx,* that an inexperienced operator is tempted to suspect the existence of an abnormal obstruction. It is obvious that the sponge must not be left to dry in the air, but must be thoroughly cleansed, that is to say, disinfected between each time of using it. I have on page 223 in my first lecture sufficiently described the technical part of this manipulation. The best œsophageal sounds are those made of prepared catgut, supple, and either rounded off to a blunt end, or provided with a gradually tapering point ending in a knob. Although the latter appears to have a great advantage in the facility which it affords for penetrating a stenosed or strictured part, yet it will be found to wear out more quickly, as the thin part just above the knob is very apt to break after repeated use. I never use sounds with a wire in the middle, or consisting exclusively of whalebone, as they are too hard, or—in a physical sense—too elastic and give rise to the danger of perforation. It is necessary to have a supply of sounds, of different sizes, corresponding with numbers 13 to 30 of Charrière's scale, in order to be able to use decreasing sizes. Unfortunately the finer the instrument, the less is the needful feeling of resistance perceptible to the operator; and when a sound the thickness of a fowl's quill is used, it is no longer possible to distinguish whether it is being passed further or whether it is bent or twisted like a corkscrew. On this account I prefer the œsophageal or stomach pipes, which are only to be distinguished from the sounds by their hollowness, and the fact that they are furnished with two transverse fenestræ cut in the side near the rounded end. They not only answer all the purposes of sounding, but also the very smallest of them enables the operator to pour in fluid and thus ascertain whether the contracted part has been passed or not. They also possess the further advantage that under all circumstances when they have been successfully passed through the œsophagus (no matter what the injury to that part may be) nourishment in the form of fluid can be at once introduced into the stomach, and this—considering that it is so often a matter of chance whether the tube passes into the stomach or not—is an advantage not to be despised. On this account I always make use of the so-called feeding tubes, having a funnel-shaped enlargement at the upper end, so as to be able to give nourishment if required.

---

* Waldeyer. Beiträge zur normalen und vergleichenden Anatomie des Pharynx, mit besonderer Beziehung auf den Schlingweg. Sitzungsber. d. Akad. d. Wissensch. zu Berlin, Physik.-math.-Klasse, 1886, 25th Febr.

Finally, tubes with fenestræ are preferable, because particles of tissue which would not adhere to a sponge are frequently caught in the edges of the fenestræ. Soft india-rubber tubes are of course out of the question for sounding the œsophagus, and surmounting obstacles in an obstructed part; for the purposes of sounding a certain amount of firmness in the instrument is required, but a simple soft tube, open at the lower end, has often proved useful to me in cases of cancerous stricture, the end of the tube being passed as far down as possible, has encountered the tumour, and penetrated the funnel-shaped contraction; so that when the patient has been desired to cough and retch, fragments of the tumour which did not adhere to the œsophageal probang, or to the stiff pipe, have been pressed into the tube.

Returning, after this digression, to the further discussion of the matter ejected by our patient, I am inclined—apart from the negative results of the so-called physical methods of examination—to lay the greatest stress on the results of the chemical examination of the ejected matter, because in doubtful cases these results may be of the most decisive importance for purposes of diagnosis. The following instance will prove the truth of my statement:—

Mrs. S., a woman of 62 years of age, suffering from carcinoma of the stomach and liver, when examined with the sound, showed signs of an obstruction, exactly similar to that in the case which we are now considering. In this instance too the instrument was stopped by an insurmountable obstacle in the region of the ensiform cartilage. Just above this part the operator had the unmistakable impression that the instrument was passing through a contracted passage, and this was immediately followed by the hissing sound caused by the escape of air from the stomach. The cause of this obstacle to the passing of the sound remained doubtful as long so the patient was alive. A *post-mortem* examination, however, explained the situation, by showing that a large growth, extending upwards from the retroperitoneal tissue, had involved the cardiac orifice, and had pushed up the fundus of the stomach horizontally, so that, to a certain extent, two divisions of the stomach had been formed, one horizontal, the other vertical. The sound had struck against the floor of the former. In order to give a more definite idea of the condition, I add here the two semi-diagrammatic figures 5 and 6, taken from drawings made by me at the time.

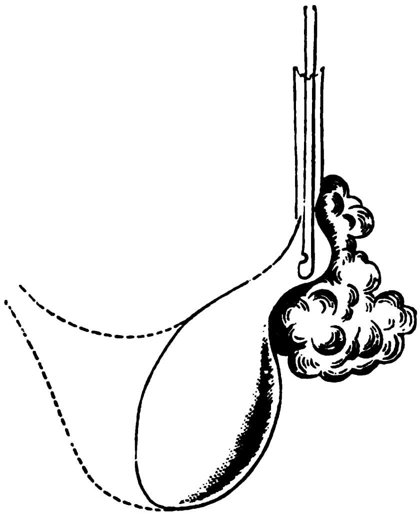


Fig. 5.—Stomach of Mrs. S., died June 30th, 1887. Side view showing the growth round the cardiac orifice, and the cæcal pouch formed by the tumour.

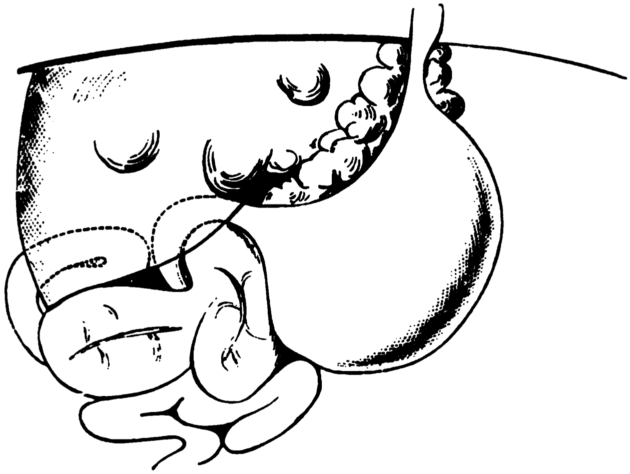


Fig. 6.—Stomach of Mrs. S. Front view showing cancer of the anterior surface of the liver, the head of the pancreas, the cardiac orifice, and the retroperitoneal tissue.

It may be that similar conditions exist in the case which we are now considering, or possibly, as Quincke[*] has pointed out, there may be a closed valve-like formation, sufficient to hinder the passage of the sound, the result of an ulcer of the œsophagus. But while in the case of Mrs. S. the matter brought up through the tube was invariably proved to contain pepsin, and on some occasions peptone also, and was repeatedly tinged yellow from admixture of bile, in the case which we are now considering the ejected matter is absolutely indifferent. This is a convincing proof that it does not come from the cavity of the stomach.

Having proved, beyond the possibility of doubt, the existence of stricture of the cardiac orifice, we now go on to inquire into the nature, that is to say, the cause of the disease, which is a far more difficult question to settle.

The closing of the cardiac orifice may, as I said at the beginning of this lecture, result from three causes: 1, *spasmodic contraction*, or 2, *the formation of a cicatrix*, or 3, *a new growth, i.e., a tumour, inside or outside the orifice*. The former, *spasmodic contraction*, which is invariably the result of a neurosis or reflex action, and may thus be considered to be functional, may in general be easily distinguished from organic stricture by the following important symptoms: in most cases it is intermittent, sometimes disappearing entirely, at others interfering but slightly with the power of swallowing, and then coming on in paroxysms in consequence of a mental shock, debilitating causes,[†] neuralgia,[‡] palpitation of the heart, &c. Direct or more remote causes of irritation, such as œsophagitis and gastritis, even carcinoma of the stomach, metritis, pregnancy, or worms, may give rise to spasm in the œsophagus. It appears also in cases where the patient has a neuropathic tendency, or is suffering from nervousness, neurasthenia, or hysteria, and a long course of observation shows that it is the strongly defined local symptom of a general nervous affection. Finally, and this is the most important point, a strong sound will overcome the obstruction, either directly, or shortly after it has been introduced, or under chloroform. I say advisedly a strong sound, with which the spasm is overcome better than by thin instruments.

---

[*] Quincke. Klappenbildung an der Cardia. Deutsch. Arch. f. klin. Med. 1882, Bd. xxxi. p. 408.

[†] Carron. Observation sur une suspension de la déglutition pendant plus de deux jours produite par un émétique violent chez un homme atteint d'une dyspepsie rhumatique. Journ. génér. de méd., chirurg. et pharm. Paris, 1811, pp. 58—62. A remarkable case was published under the title of "Spasmodic inability of deglutition caused by mercurial inunction." Med. Obs. Soc. Phys., London, 1784, which I have not been able to get at.

[‡] Coin relates a case of spasm of the œsophagus and air passages from dorso-intercostal neuralgia, in which an organic stricture was simulated. Charleston Med. J. Rev., 1851, pp. 199—205.

It is well known that spasmodic stricture may make its appearance in any part of the œsophagus, and under certain conditions become so violent as to simulate hydrophobia.* It may continue for months, or even years, without materially affecting the nutrition of the patient, and one meets now and then with corpulent ladies, who, according to their own showing, "cannot swallow a morsel"; but on the other hand spasm may lead to the most serious disturbances of nutrition, and even end fatally.† Under such circumstances the place where the spasmodic obstruction occurs may be ascertained by the length to which the sound is passed—unless, as I have experienced in one instance, the sound can be passed easily into the stomach, and the spasm only makes its appearance during the act of eating, that is to say, when solid or liquid food is swallowed, and sometimes only after a certain quantity of food has been taken. In such cases, patients are usually able to overcome the spasm by means of various manipulations, as the following account will show.‡

Miss M., from New York, 15th of August, 1885, aged 33 years, a well-nourished lady. Appetite good, action of the bowels regular. Asserts that solid and liquid food do not enter the stomach. Is able to take a small plateful of soup, or a corresponding quantity of other food, but is then obliged to make extraordinary efforts to pass it into the stomach.

The stomach is in its normal position, and somewhat dilated. The patient eats two cakes and drinks a glass of water, without the murmur made in swallowing becoming audible. She then pumps air into the œsophagus, by means of repeatedly drawing a deep breath and going through the motions of swallowing, and at the same time a loud noise is heard over the epigastrium as of food entering the stomach. The stomach tube passes no further than the cardiac orifice, but an English sound, after surmounting a slight obstacle, passes into the stomach. In this case the spasm—which could be accounted for by no manifestly hysteric or neuropathic condition—could be overcome, and in consequence the nutrition of the patient was little affected. But in spite of this her condition was most painful and distressing, for she was compelled at every meal to leave the table directly after having swallowed a few mouthfuls, in order to attend to her swallowing gymnastics, and in consequence she found herself cut off from all society except that of her most intimate friends. This was manifestly a case of spasm of the cardiac orifice, in consequence of hypersensibility of that structure, a condition which we shall discuss later on, when we come to speak of the neuroses of the stomach.

---

* J. Barnes. A singular case of spasmodic disease, simulating hydrophobia Amer. Med. Record, 1822, pp. 650—652.

† H. Power, On a case of spasmodic stricture of the œsophagus terminating fatally. The Lancet, 1866, i. No. 10. The patient died of inanition, no operation being allowed. At the autopsy nothing was found.

‡ The case was afterwards published by Dr. Meltzer, of New York, in the Berl. klin. Wochenschr. 1888, No. 8.

Strictures formed by cicatricial tissue at the cardiac orifice, or in the lower division of the œsophagus are, as is well known, the most usual results of injury to that organ by corrosive substances, strong acids, or caustic alkalies. Virchow has already pointed out that these parts are specially liable to these injurious effects, and this is easily understood, as the examinations of Kronecker and Meltzer have proved that the material swallowed stops immediately before the cardiac orifice, after having been passed quickly through the œsophagus. Other rarer causes of cicatricial stricture, and altogether rarer diseases, are syphilitic and tubercular ulcers, and the round ulcer of the œsophagus, which, according to the researches of Quincke,* may also lead to contraction of the œsophagus, and is usually found directly over the cardiac orifice.

There is in my possession a drawing from the portfolio of the late Dr. von Frerichs, of a similar ulcer, formed directly over the cardiac orifice, which produced extreme cicatricial contraction with consecutive dilatation of the œsophagus.

The cicatricial tissue is firm, not ulcerated, and has a strong tendency to contract, so that strictures of this kind when left to themselves soon reach an advanced stage, and even lead to dense fibrous obliteration of the œsophagus. In most cases the stricture is easily overcome by means of a sound of the proper size, because the surface of the cicatricial tissue is smooth and usually presents no unevenness in which the point of the sound can catch (see Quincke's case already quoted). The symptoms related by the patient and the negative result of an examination for cancer are conclusive from a diagnostic point of view.

---

* H. Quincke. Ulcus oesophagi ex digestione. Deutsch. Arch. f. klin. Med. Bd. xxiv. p. 72.

New growths which lead to stenosis of the cardiac orifice are divided into those which act by pressure from without, and those lying within the wall of the digestive tract, and gradually extending so as to obliterate its lumen.

Those acting by pressure from without are either tumours, abscesses, or solid masses of carcinomatous, sarcomatous, or fibrous nature, which develop in the mediastinal or retroperitoneal tissue, or collections of cancerous or scrofulous glands. Under normal conditions there is a mass of glands directly above the œsophageal opening of the diaphragm.* Or they are periosteal tumours, or new formations of bone growing from the vertebral column, or, finally, aneurisms of the large vessels. Conditions of this kind are most easily recognised by careful consideration of the history of the patient with all its concurring symptoms. It would lead me too far from the point to enter here into details of differential diagnosis, but I must not omit to warn you expressly against the use of stiff sounds or tubes in the manual examination of such cases. Under such conditions the most careful manipulation can never entirely exclude the danger of rupture, and hard instruments are always to be avoided, especially as (when the only question is whether the passage into the stomach is free) a soft tube will generally answer the purpose required, the hindrances formed by the above-mentioned processes usually being of a nature not difficult to overcome. Abercrombie has placed on record a case of rupture. Von Frerichs in his lectures was in the habit of quoting, as a warning, a case in which an undiscovered aneurism of the thoracic aorta was the cause of the difficulty in deglutition. A stiff œsophageal tube was introduced, and the point of it perforated the wall of the œsophagus which lay next the aneurism and was thinned by it, so that the patient bled to death. I can report the following case from personal experience:—

A gentleman, forty-five years of age, had long suffered from paroxysms of shooting pain in the region of the mediastinum, or rather the ensiform cartilage, which, at their worst, became so unbearable that he could only be relieved by the injection of strong doses of morphine. He became a prey to the influence of morphine, and was then treated by abstinence. For a time the paroxysms were less violent, but they soon returned in full force. As no objective cause could be found for the malady it was supposed to result from mental disorder or hysteria; syphilis, from which he had formerly suffered, was also taken into consideration, and although syphilitic tumours usually cause little or no pain, a course of treatment for syphilis was entered upon. During the later stages of the disease, feelings of oppression during meals appeared, as if the food were unable to enter the stomach; the appetite, which had long been capricious, now failed entirely, and there was serious decrease in his strength. There were no symptoms of fever, but, on the other hand, some muco-purulent expectoration, in which no elastic fibres—this was before the days of the bacillus—were found. It was proposed to sound the œsophagus, but I discovered, by means of percussion, an abnormally extensive cardiac dulness, extending on the right side as far as the right border of the sternum, and above and to the left, to the lower edge of the third rib, so that the heart sounds being clear, the radial pulse regular, and equal on both sides, and there being no dulness or murmur of any kind audible in the back, except the signs of a slight catarrh, I was led, in consideration of the paroxysms of pain suffered by the patient, and the other symptoms put together, to suppose that he was suffering from a mediastinal tumour, perhaps an aneurism, and, in consequence, I opposed the introduction of an œsophageal sound.

---

* Vide Thaddeus. Dysphagie durch Schwellung der Bronchialdrüsen. Berl. klin. Wochenschr. 1889, No. 36.

Forty-eight hours afterwards the patient had a most violent attack of hæmorrhage in the night, bringing up pure, not frothy, blood, "just as if it poured out of his mouth," and expired in a few minutes. Although a *post-mortem* examination was not allowed, there can be no doubt that a rupture of one of the larger blood-vessels into the œsophagus had taken place, and it is equally beyond a doubt that this rupture was ascribed, either rightly or wrongly, to an introduction of the sound which had taken place some time before.

A similar case, which I saw, was shown at the Berlin Medical Society, in August, 1890, and was suspected for carcinoma. A man, aged sixty-two, complained of pains in the stomach. There was no tumour, but general weakness and emaciation, with some cough. Heart and heart-sounds normal. On introducing a soft stomach-tube the patient fell back and died in a few minutes, the heart's dulness undergoing rapid increase, with development of a friction sound over it. There was no hæmatemesis nor any blood on the tube. Diagnosis: Hæmatopericardium ex perforatione vel ruptura aneurysmatis. The *post-mortem* examination showed that there was no communication between the œsophagus and the heart, nor any new growth in the œsophagus, but there was a false aneurism at the commencement of the ascending aorta, just over the aortic valves and within the pericardium, commencing just at the reflection of the pericardium. At this point the wall of the sac had given way and the blood had poured into the pericardium. Some doubt exists as to whether there was any causal relation between the introduction of the tube and the accident.

Cases such as these lead us to advise extreme care in the use of the sound, and you will not think me over-careful when I tell you that I never undertake the sounding of the œsophagus or the stomach without having first made a most minute investigation of the condition of the heart and the organs connected with it.

Constricting tumours of the cardiac orifice are always of a carcinomatous nature, and are hardly ever confined to that region. They extend either from above or below, and it is most unusual for them to originate directly in the cardia. In most cases they extend downwards to the cardia from the lower division of the œsophagus, or upwards from the cardiac portion of the stomach. Rokitanski* notices as a special peculiarity of affections of the cardia, in contradistinction to pyloric cancer, that they have a constant tendency to attack the œsophagus. Brinton,† in opposition to this statement, quotes two cases of distinctly local cancer of the cardiac orifice, and expresses his opinion with regard to the rarer appearance of malignant tumour of the cardia, that cases of cancer, confined to the pylorus, and those confined to the cardia, are found in about equal numbers, that is to say, in the proportion of one to fifteen of those cases where it is more widely extended. Not to mention my comparatively small personal experience, which, however, coincides with Rokitanski's opinion, I have found only few cases of isolated cancer of the cardiac orifice in the books which deal with this subject. Hanot* describes two cases of epithelial carcinoma of the size of hens' eggs which were strictly confined to the cardiac orifice; and in the magnificent collections of the Pathological Institute of this city, to which I have access through the kindness of Professor Virchow, I have only found one further case, a representation of which, made by me, will be found on the next page (fig. 7). If by localised cancer we understand a growth strictly confined to the muscular ring which surrounds the cardiac orifice, the anatomical arrangement of the muscular layers (which, as is well known, extend in bands, forming a half-circle, and crossing each other from the cardiac orifice to the fundus of the stomach) makes it evident that the tendency to spread in an upward and downward direction depends upon the nature of this anatomical arrangement. As a rule it is difficult to assign a cause for these tumours, and any inherited tendency, the importance of which we shall discuss later on, when we come to speak of cancer of the stomach, is more often absent than not. I must not omit to mention that two of my patients have had no hesitation in ascribing the origin of the malady to an injury. One, a lawyer, dated his sufferings from a fall, in which he had given himself a blow in the chest; the other, a countryman, declared that while working one day in the fields he became aware of a stinging pain in the chest, and that since that time the complaint had developed. Both were cases of cancer of the cardiac orifice. I need not tell you that statements of this kind must be received with the utmost caution. The well-known longing to assign a cause for everything, common to humanity, but most strongly developed in sick people, leads to frequent confusion between *post hoc* and *propter hoc*. But as it has been proved that injuries may give rise to carcinoma, this relation, which, so far as I know, has not been noticed before, seems to me sufficiently interesting to be mentioned.

---

* Rokitanski. Handbuch der speciellen pathologischen Anatomie. Bd. xi. p. 205.

† Brinton. Lectures on the Diseases of the Stomach. 2nd. edit., Lond. 1864, p. 227.

The nature and diagnosis of cancer of the stomach will be treated in a later lecture (*vide* Lecture on Carcinoma of the Stomach).

We will now return to the case under consideration to-day.

---

* Hanot. Arch. génér. de méd., Oct., 1881.

Out of the various causes which must be taken into consideration in assigning an origin to the stenosis of our patient, one is immediately rejected: cicatricial stricture of the œsophagus.

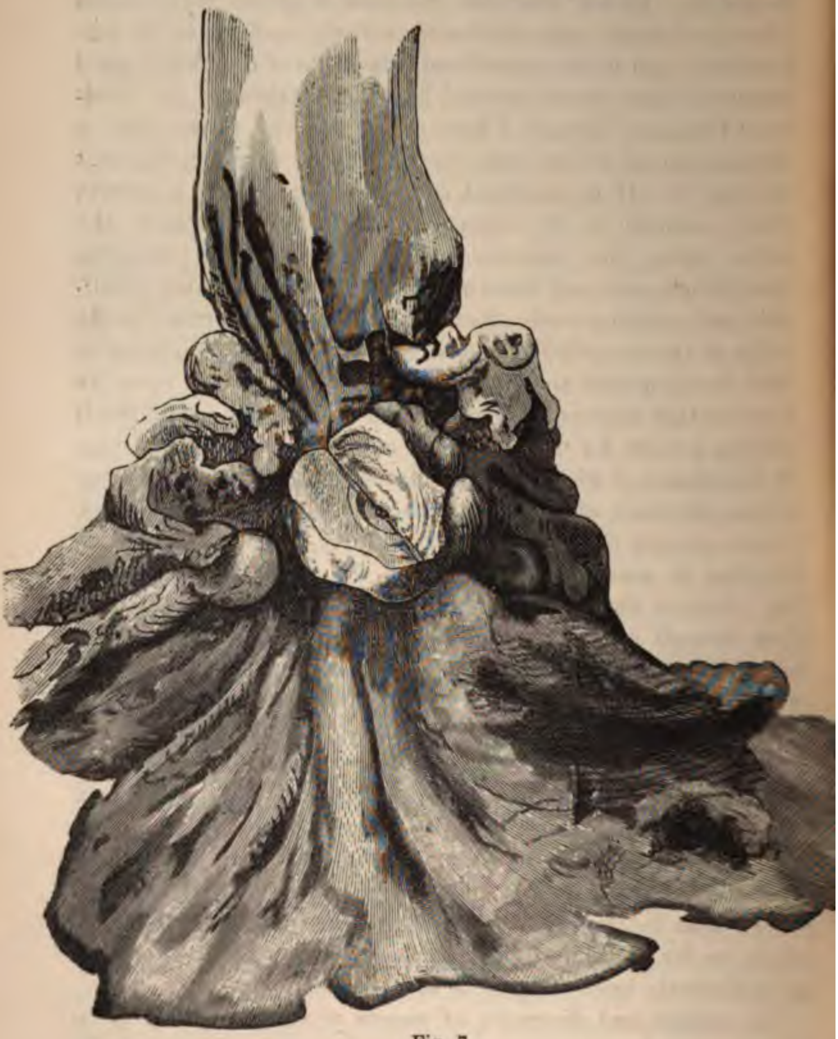


Fig. 7.

The patient has never taken corrosive fluids. Although his employment as keeper of a restaurant might have tempted him to do so, he has no recollection of ever having taken food sufficiently hot to produce the well-known burning feeling in any part of the primæ viæ or in the stomach. He has never suffered either from a blow or from pressure in the anterior thoracic region; there are no symptoms which point to disease of the respiratory organs, of the circulation, or of the bones. There is no fever. The statements made by the patient, and the objective results of examination, put spasmodic contraction out of the question. Any idea of the existence of a diverticulum, that is to say, a partial sac-like expansion of the wall of the œsophagus without any contraction, is excluded by the fact that a diverticulum always forms in the upper part of the œsophagus, and if we divide it equally into three parts, usually in the first part, never extending downwards to the level of the cardiac orifice. Thus by exclusion we are led to conclude the existence of a carcinomatous stricture of the cardiac orifice. Of this, too, we can produce no positive proofs, but the absence of these, especially the absence of swollen glands, the want of evidence of cancer elements, the freedom from pain, the comparatively slight muscular wasting and loss of strength, is not opposed to this conclusion.

A short time ago I observed a case exactly similar to the one we are now considering, only to be distinguished from it by the fact that emaciation and loss of strength were present in a far greater degree. In this instance, too, the statements made by the patient and the objective results of examination failed to yield any certain evidence of cancer. The stricture was usually impassable, but could be overcome now and then by means of a fine sound. We made an artificial gastric fistula, and, while carrying out the operation, were enabled to examine the stomach and neighbouring organs through the abdominal wound. We could thus most distinctly trace a rather superficial tumour, apparently a little wider than a finger's breadth, which extended like a ring round the cardiac orifice below the diaphragm. The patient died a few weeks after the operation away from Berlin, and unfortunately no *post-mortem* examination was made, but in this case the diagnosis of cancer could not have been made more certain by ocular inspection. In the case of our patient, as in so many others, negative evidence is almost as important as positive discoveries, and we are justified in making a diagnosis of cancerous stricture of the cardiac orifice, although the question must remain unanswered as to whether it lies within or without the canal. It remains for us to discuss a condition which almost invariably results from long-continued stricture of the œsophagus connected with the cardiac orifice: dilatation of the œsophagus above the contracted part. But the fact that these secondary dilatations rarely take place in cases of carcinomatous stricture, which usually end rapidly in death, is explained by the length of time required for the action of the contracted part on that lying immediately above it.

Sac-like expansions of the œsophagus have long been divided into diverticula from pressure, diverticula from traction, and simple dilatation.

The two first-named forms are partial expansions of the circumference of the wall of the œsophagus, which take the form of cæcal appendages to the otherwise normally wide lumen, and which, when distended, are clearly visible as circumscribed projections on the outer surface. They are out of the scope of our present discussion, being, as I have already said, found exclusively in the two upper divisions of the œsophagus; in the first being usually confined to the boundary between the pharynx and the œsophagus, so that only those in the second part belong to our subject.

As a rule, dilatations formed above a contracted part take in the whole circumference of the œsophagus, and in cases of long standing cause complete atrophy of the mucous membrane and wide-meshed stretching of the muscularis; but it sometimes happens that the dilatation develops exclusively in one direction, and thus gradually forms a pouch. In order to cause this it is only necessary that there should be a local yielding of the muscular fibres of the œsophagus to the pressure of food. A case of this kind, that of a girl of 4 years old, suffering from corrosive stricture of the œsophagus, is recorded by Nicoladoni.* Above the stricture of the œsophagus, 8 cm. long, there was a dilatation 2½ cm. in length, not, however, extending over the whole œsophagus, but almost confined to the anterior part of the left wall, so that a sac-like diverticulum was formed, sharply bounded by the stricture, large enough to hold the entire terminal phalanx of the first finger. Under such conditions, that is to say, when the stricture is not close above the cardiac orifice, but higher up in the œsophagus, partial dilatation may be the original cause of the development of a diverticulum, for which there would be no space immediately above the diaphragm.

---

* Nicoladoni. Wiener med. Wochenschr. 1877, No. 25.

In the case before us to-day the dilatation must have gone on to a considerable extent for it to be possible for the dilated part to contain fluid amounting to more than 100 cc. This could only happen at the expense of the adjacent organs, which would be compressed or pushed out of place.

Wheatley Hart* describes the case of a woman, 58 years of age, who after having suffered for 20 years from dysphagia, combined with constant vomiting, gradually sank from marasmus. An autopsy yielded the following results: the stomach, the mucous membrane of which was in its normal condition, was small, the cardiac orifice so narrow that the little finger could hardly pass through it, but its tissue was neither thick nor hard. Above this part the œsophagus was enormously distended, so that on the right side of the vertebral column it lay in the hollow of the ribs, and then, bent almost at right angles, it turned towards the diaphragmatic orifice. It looked like a second stomach after it was taken out, and was large enough to contain more than 750 grammes of fluid. The muscular coat was much hypertrophied. Hart believes that the œsophagus became adherent to the lungs and pericardium, and was then dragged out by retracting pleurisy and mediastinitis, both processes being found in an advanced stage of development.

Dilatation may also be caused by long-standing spasmodic contraction of the œsophagus or cardia. Leichtenstern † gives a very striking example in a case of hysterical vomiting of seven years standing. I have seen a curious case of organic cancerous stricture situated in the middle of the œsophagus, in which the dilatation did not take place above the stricture but below it,‡ and was evidently caused by fatty degeneration and atrophy of the muscular wall, which on becoming unable to contract so as to pass the food onwards, became dilated by the mass accumulating above the cardia, as pointed out by Kronecker and Meltzer.

---

* Wheatley Hart. Autopsy on a case of prolonged vomiting. Lancet, 1883, ii. p. 456.

† Leichtenstern. Enorme sackartige Erweiterung des Œsophagus ohne mechanische Stenose desselben, in einem Falle von siebenjährigem hysterischen Erbrechen. Deutsche med. Wochenschr. 1891, No. 14.

‡ Ewald. Berliner klin. Wochenschr. 1889, No. 22.

One of my patients, who suffered from exactly the same complaint as the patient whom I have brought before your notice to-day, complained of great dyspnœa directly the demands made upon the respiratory organs were in any way increased, that is to say, whenever he went upstairs or from one room to another rather more quickly than usual. The patient whom you now see was suffering so much from dyspnœa the first time he came to me, that for a moment I believed him to be suffering from disease of the heart or the lungs. The general debility of the patient may be the primary cause of this condition, but it may also be partly ascribed to a purely mechanical cause, the compression of the lungs and the displacement of the heart.

There can be no mistake with regard to the *treatment* of this case. The stricture being to all intents and purposes impassable, thus excluding the use of so-called internal remedies (not to mention the fact that we have no specific remedy), and mechanical dilatation being impossible, we have no resource but gastrostomy and feeding *per rectum*.

Feeding *per rectum*, although useful for a short time, is not sufficient for cases of long standing, and must, therefore, be combined with gastrostomy, when the entrance to the stomach is closed for the passage of all kinds of nourishment. We will carry out the operation and endeavour if possible to effect the dilatation of the contracted part from the stomach, without causing hæmorrhage.

Gentlemen, the patient, brought before your notice on the 3rd inst., having been shown to be suffering from a cancerous stricture of the cardiac orifice, and gastrostomy decided upon, was operated upon in my presence five days later by Dr. Sonnenburg. I must draw your attention to the remarks made by Dr. Sonnenburg with regard to the performance of the operation, which he has kindly placed at my disposal, and which you will find at the end of this lecture. For the present I will merely state that we palpated the stomach after the opening of the peritoneal cavity without being able to discover any abnormal condition in that organ.

When two days afterwards the fistula was made, the stomach proved to be empty, containing only a small quantity of mucus, which when placed on a strip of litmus paper gave a neutral reaction.

The condition of the patient was most satisfactory for three days after the formation of the fistula. He complained only on pressure, and had no difficulty in retaining the nutrient enemata and soup which were injected through the fistula. On the fourth day he began to cough and to expectorate greenish yellow fluid sputa, containing small, firm, white particles, varying in size from a grain of sand to a pin's head. The cough became more frequent and more violent, especially in the night, and refused to yield to the influence of morphine injections. A penetrating *fœtor ex ore* developed itself, and the evening temperature rose to 39·2° (102·5° F.). Examination of the sputa revealed the existence of numerous pus corpuscles, free nuclei, bacteria, and masses of cocci, but no tubercle bacilli, and no elastic fibres. The plugs mentioned above consisted of innumerable short bacilli, almost amounting to a pure culture. An unsuccessful attempt was made to check decomposition by washing out the œsophagus with a solution of salicylic acid, and by giving it in capsules. Dulness and bronchial breathing made their appearance at the bases of both lungs. Elastic fibres were now visible in the sputa, and pleuro-pneumonia on both sides was diagnosed, caused by perforation or entrance of food into the air-passages. The fever persisted, there was a rapid failure of strength, and eight days after the operation the patient died in a slightly somnolent state. The *post-mortem* examination made by me yielded the following results:—

The stomach with its fundus lies in the hollow of the diaphragm. Its greatest width is rather less than 12 cm., and its length from the pylorus to the cardiac orifice 30 cm. The organ when opened measures nearly 19 cm. across. The orifice of the fistula is on the right side 6 cm. above the ring of the pylorus. Its edges are swelled so that externally the mucous membrane lies flat over the muscularis. The pylorus when felt from the outside is thick and swollen, and when the organ is opened the cause is revealed in a thickening of the sub-mucous connective tissue, while the muscularis and the serous coat are not affected. Looked at from the outside the œsophagus above the cardiac orifice presents a hard sausage-like dilatation 6—7 cm. in length. A narrow glass tube sometimes catches in a pocket, sometimes passes through a narrow passage into the stomach. Water poured in from above enters the stomach slowly, having first quickly filled the œsophagus. This latter is distended above the tumour, so that 5 cm. higher than the edge of it its average width is 6 cm., after which it gradually contracts, and 13 cm. higher up measures only rather more than 3 cm. across. The opening of the œsophagus shows that the tumour begins exactly at the cardiac orifice, and is divided by the incision into two oval parts, the larger on the right and the smaller on the left, leaving between them a narrow channel only passable for a fine lead pencil, and covered in addition with wart-like polypoid growths. The tumour is so far from being solid that on the right side it tears from top to bottom, revealing a cavity or fissure lined with a fairly compact greyish-green membrane. (See fig. 8, page 301.)

In the mucous membrane of the œsophagus there lie beneath the surface small round punctiform whitish transparent nodules, and the epithelium is in places detached in shreds as if it had been scalded. This is also the case immediately below the tumour where it passes into the mucous membrane of the stomach. The latter in the fundus is smooth and of a beautiful pink colour; the other parts are contracted in folds and slate-grey in colour. Neither punctiform hæmorrhages nor ecchymoses are to be found. The left side of the œsophagus has become adherent to the visceral pleura, by recent adhesive inflammation, for a length corresponding with the extent of the tumour. A lymphatic gland on the left side above the diaphragm is slightly enlarged, and when cut across shows the early signs of punctiform suppuration.

In both lungs the lower lobes are of a rich red-brown colour, swollen, and completely void of air. The upper lobes of both and the middle lobe of the right lung contain air; the pleura on both the lower lobes is covered with a delicate recent layer of fibrinous lymph. Added to this there are great numbers of sharply-defined round spots, varying from the size of a lentil to that of a pea, of a bright greenish-yellow purulent colour in both lungs, especially abundant at the base of the right lung, but less numerous at the posterior surface of the lower lobes. When these are cut into they prove to be cavities lined with membrane and filled with sticky greenish-yellow matter, which has a penetrating and offensive smell. In each of these cavities a bronchus, that is to say, a bronchiole, may be traced. The mucous membrane of each bronchus is of a dark purple colour,

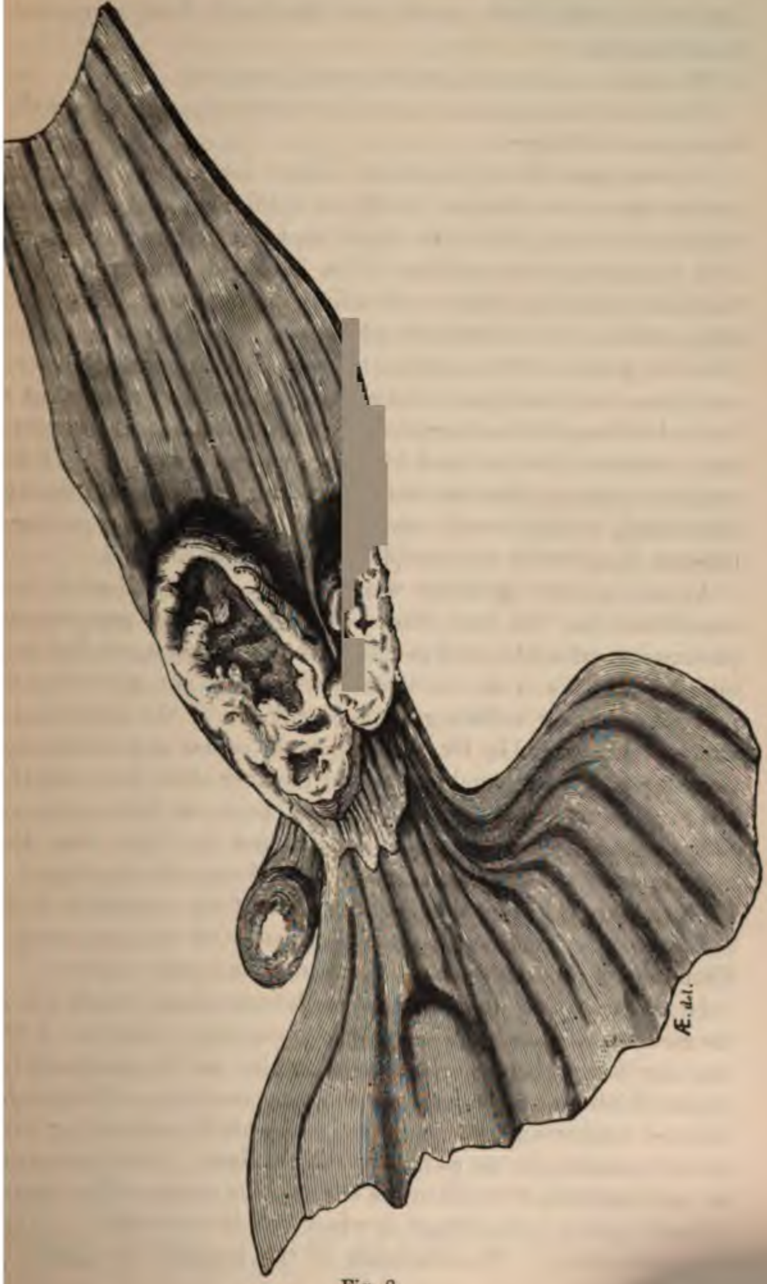


Fig. 8.

like velvet to the touch, swollen and filled with frothy, purulent, bloody matter.

The other organs are in their normal condition.

The small intestines are unusually contracted to less than the thickness of a finger.

A small particle of the fresh tumour taken from its upper surface shows the utmost variety of cylindrical and squamous epithelium, round cells with large nuclei, and masses of cocci. The microscopic examination of the hardened tumour shows it to be an epithelial cancer extending to the serous coat, with degeneration of its elements in places.

In the protocol of the *post-mortem* examination here laid before you, there is a discrepancy between the possibility of passing a fine tube through the contracted part after death, and the complete stricture which existed while the patient was alive. If we consider, however, that the tissues lose their turgidity and shrink after death, we shall easily comprehend that the narrow passage between the growths was completely blocked during life.

At any rate the operation was not only fully indicated, but would have had the best chance of success if the gangrenous pneumonia, caused by food getting into the air-passages, had not interfered. This is an occurrence which we are powerless to prevent. A lady suffering from carcinoma of the œsophagus, who was also treated by Dr. Sonnenburg by means of gastrostomy, was as well as her condition would possibly allow five months after the operation, although the right breast had been removed five years before on account of cancer, and the right arm disarticulated at a more recent date. She afterwards developed a fresh metastasis in the right pleura, of which she eventually died.

Let us now, gentlemen, close the history of this case with a discussion of the *treatment of strictures of the cardiac orifice.*

In all cases of organic stricture of the œsophagus which lie at the cardiac orifice, we can only look to surgery to help us. No one any longer believes that good results can be produced by means of internal remedies, such as iodine, mercury, or the much-vaunted condurango, which were the so-called resolvent or dissolvent remedies in use at no very distant date. It only remains for us to endeavour to dilate the stricture by means of the sound without causing hæmorrhage, or where this is impossible to carry out gastrostomy. The dilatation of the stenosis by means of bougies implies a partial introduction of the sound into the contracted part. This will generally succeed at first in cases where the stricture is simple and not complete, and where there is no secondary dilatation of the part immediately above. It is advisable to use the thickest sounds possible, or at least to commence operations with them. The finer the sound the greater is the danger that its point may become entangled in the uneven surface of the contracted part, or in the pockets of the secondary dilatation, even when these inequalities are so slight that a thicker sound would pass them without difficulty. It is always in such cases to a great extent a matter of chance; sometimes the sound glides in easily, at others it catches at the point. I have often found it advantageous to cause the patient to propel the sound himself to a certain extent, by means of repeated acts of swallowing; it will then slip down spontaneously in the right direction, and can be introduced further by means of slight pressure from above. I must, however, warn you against the too frequent use of the sound. It has happened, in my experience, that a sound, corresponding with No. 20 of Charrière's scale, passed through the stricture for the first few times with comparative ease, but on the fourth or fifth day could no longer be passed, because a violent swelling or a rapid growth in the affected part had manifestly been set up by the irritation caused by the sound. Mackenzie* has noticed the same thing. The sound should be left in from three to five minutes, and when taken out should be replaced by a thicker one. Many patients who feel no inconvenience from the passing of the sound, find its presence unpleasant after a short time, because of the secretion of saliva which is caused by it. In such cases I usually inject a dose of three milligrammes of atropine and five milligrammes of morphine before the introduction of the sound. By these means the secretion of saliva is stopped, or rather prevented from beginning, and the morphine increases the tolerance of the patient. Stems of whalebone, provided with a set of olive-shaped ivory ends, which can be screwed on larger or smaller as required, are sometimes used instead of the English sounds. Fine English sounds, with a pear-shaped enlargement at the lower end, are also manufactured. In Frerichs' clinic we habitually made use of long smooth whalebone stems of various sizes. When the stricture is not too extreme, a soft india-rubber œsophageal tube of the proper calibre may be introduced as far as the stomach, and left there for a certain time. By these means the patient will suffer less inconvenience than if a stiff sound were passed in and left, if only for the reason that he can shut his mouth, and there is no disagreeable secretion of saliva; the symptoms of irritation are less, too, in the affected part.

---

* Morell Mackenzie. Die Krankheiten des Halses und der Nase. Uebers. von F. Semon. Berlin, 1884, pp. 130 and 185.

In conclusion, I must mention that Switzer, of Copenhagen, in 1843, suggested the use of a permanent canula, which was afterwards used by Krishaber, Mackenzie, Symonds, and finally by Leyden and Renvers,* in the form of a catheter à demeure. A slightly conical, and on section slightly oval-shaped tube of vulcanite, or an india-rubber catheter, is fastened to two strong silk threads, and by means of a whalebone stem is introduced into the contracted part, and left there after the withdrawal of the stem, the silk threads being either brought out of the mouth and wound round the ears, or in some cases brought out through the nose. The tube, unless it becomes obstructed, is left, sometimes as long as a fortnight, in the affected part, then withdrawn and replaced by another. A certain permeability of the stricture is required for this method of treatment, as the canula cannot well be smaller than a good-sized pencil, unless, as Mackenzie † suggests, the catheter is forcibly passed through the stricture—an operation which, granted that it is possible, is certainly not advisable. Leyden and Renvers, in two cases in which they made a diagnosis of cancer of the œsophagus, were fortunate enough to obtain good results, that is to say, a continued increase in weight of the patient, by the use of the permanent canula. In many cases in which a *post-mortem* examination has afterwards proved the existence of carcinoma, I have been able to obtain temporary improvement in the condition of the patient by these means, but in a comparatively short time I was obliged to discontinue their use, as the patients could bear them no longer. Sonnenburg ‡ is right in his remark that the generality of cases do not lend themselves to this treatment, which is apt to lead to more rapid proliferation of the cancer, sudden hæmorrhage, necrosis, rupture, &c. When, as we are now considering, the stricture is in the lowest part of the œsophagus, the tube must penetrate into the stomach. It is doubtful whether this is possible without producing chronic irritation, but this point has not yet been investigated. This remark also applies to a "permanent sound for the œsophagus" lately invented by Gersuny.*

---

* E Leyden and Renvers. Ueber die Behandlung carcinomatöser Oesophagusstricturen. D. med. Wochenschr. 1887, No. 50.

† l. c.

‡ Sonnenburg. Beiträge zur Gastrostomie. Berl. klin. Wochenschrift, 1888, No. 1.

The difficulty experienced in passing the sound increases in exact proportion to the increase in the consecutive dilatation, or in the various excrescences and projections of the obstructing tumour.

In the case of simultaneous formation of a diverticulum, appearances would sometimes lead us to suppose it possible to enter the stomach, leaving the pouch on one side, by giving a definite direction to the sound, and different authors have laid down rules by which this may be done. I consider this to be quite illusory when the obstruction is close above the cardiac orifice; no sound which can be introduced into the œsophagus is stiff enough to enable us to control the direction taken by its point, when it has penetrated so far as the lower part of the œsophagus. To be convinced of this it is only necessary to experiment on the cadaver, or with a preparation hung up in the right position containing the whole œsophagus and stomach *in continuo*. I have found it equally useless to place the patient in any special position corresponding with the position of the supposed dilatation. We must acknowledge to ourselves that in practice it is a matter of chance whether we succeed in passing the sound or not. I can, however, quote a striking instance to prove that the position in which the patient lies is of the utmost importance for the passage of food.

On the 19th of July I was consulted by Farmer B., from Stendal, who, on account of symptoms pointing to diverticulum, had been examined by various physicians, some of whom had ascribed his condition to diverticulum, others to nervous spasm. The nutritive condition of the patient and his general health appeared to be little affected. He was still able to attend to his business, but felt slight decrease in strength, and, knowing the injurious effects of diverticulum of the œsophagus, he was obliged to face the question of giving up his farm, and of preparing in retirement for the fate that threatened him. Latterly there had been a slow increase of dysphagia, the only subjective signs of which were the occasional, not constant, regurgitation of food, which, as the patient remarked, was not always that taken at the last meal. The sound could be passed to the length of 40 cm., counting from the incisor teeth, and was then caught in a sac. While this was being done the patient coughed and brought up coffee in an unchanged condition which he had taken three hours before.* The coffee contained no free acids. As long as the patient stood, no deglutition sound was audible, but when he lay down a second sound could be heard most distinctly 12 seconds after swallowing began. This was proved to be the case by numerous repetitions. The deglutition sound showed that the entrance of food into the stomach was not entirely stopped, but under certain conditions was still possible. In spite of this a second attempt to introduce the sound into the stomach failed, both when the patient was standing and when he was lying down. It is evident that in this case lying created conditions which rendered it possible for the food to slip directly into the stomach, and we may presume that the diverticulum, for no doubt there was one, was in the anterior wall, so that when the patient was lying to a certain extent it was closed, and presented no obstacle to the passage of food. At any rate the diverticulum was but a small one, for when the patient was requested to drink a whole glass of water, and an examination with regard to the deglutition sound was repeated while he was in a standing position, the sound was audible, a proof that the diverticulum was now full, and neither intercepted nor hindered the further passage of food to the stomach. A sufficient supply of nourishment was thus possible, and only in this way can the relatively good state of health of the patient be explained, a state which doubtless caused the other physicians who examined him to ascribe his sufferings not to stricture or to diverticulum, but to a spasmodic condition of the œsophagus, which is all the more probable if they, as was very likely the case, happened to have no difficulty in passing a sound into the stomach. Circumstances unfortunately did not allow of my examining the patient again, but the results just described are fully sufficient to exclude the possibility of spasmodic contraction and to enable us to diagnose a diverticulum. With regard to treatment I recommended the patient to avoid for the present all examinations with the sound, which, if it took a wrong direction, could only produce undesirable symptoms of irritation, and might lead to mechanical dilatation of the diverticulum, and to allow himself to be treated by the passing of bougies only when the malady had increased, particularly when he felt that the action of swallowing was interfered with. For the present he should, as far as possible, take his food lying down.

---

* Wiener med. Wochenschr. 1887, No. 43.

---

* In a case of Della Chiaje (quoted by Mackenzie) coffee was brought up in an unchanged condition five days after it had been taken.

Treatment by means of passing the bougie may lead to good results in cases of cicatricial stricture, if patient and doctor are possessed of sufficient perseverance, and—in case the stricture should become passable—do not leave off too soon. Even when the contracted part appears to be sufficiently dilated, the treatment should be continued for some time, because cicatricial tissue has a strong and ever-recurring tendency to contract.

After the campaign of 1870, a young doctor was under our treatment for a long time on account of a burn and consecutive stricture of the œsophagus which, when tired to death, he had contracted by drinking out of a water bottle, apparently filled with water. The bottle contained—whether accidentally or not remains a question—pure sulphuric acid. The unfortunate man could only partially eject the first hastily swallowed draught, and in consequence not only suffered from a burn of the œsophagus, but also from consecutive stricture of that organ. In the case of this patient the constant tendency to contraction, in a part treated by passing bougies, could be traced through a long course of years.

At a time when it was the fashion for maid-servants to poison themselves with vitriol (impure sulphuric acid)—it is remarkable that fashion exercises a great influence even in such tragic matters—we had more opportunity to study the nature and course of cicatricial strictures than at the present time, when the true poisons are the favourite methods of suicide. Unfortunately I possess no statistical notes made at that time, so that I can only say that my general impressions agree with the statement of other authors, that cicatricial strictures afford a favourable prognosis where they have not reached a certain stage of contraction, but in their more advanced stages give as little hope of successful treatment by means of passing the bougie as do cancerous obstructions. In these latter cases it is useless to hope for good results. The passage may be made free for a certain time, but the growth of the tumour cannot be permanently checked. We must not be surprised or give way to false hopes if, chiefly *sub finem vitæ*, the stricture should suddenly become passable, or appear to be entirely removed. This is the consequence of ulcerous disintegration, and is always to be interpreted as *signum mali ominis*.

In most cases of stricture we have no resource but gastrostomy (*το στομα*, the mouth), the creation of a stomach fistula, first proposed by Egeberg in 1837, and carried out by Sedillot in 1849. The sufferings caused by this disease, the symptoms of slow death from starvation, are indeed so horrible that every alleviation must be tried, even if it is known to be merely a passing one. Up to the present time the operation has, in most cases, been unfortunately deferred too long. Patients have a difficulty in making up their minds to an operation which, although without reason, is still considered unusual and dangerous; they yield only to direct necessity, and thus the best time, when their strength is comparatively unimpaired, is allowed to go by. Latterly a considerable improvement has been made in this direction, and the results of the operation have in consequence been increasingly favourable. While Mackenzie, in 1864, recorded 67 cases of gastrostomy in cases of carcinoma of the œsophagus, 12 in cases of cicatricial tissue, and 2 in cases of syphilitic stricture, and concluded that 5½ to 7½ months was the longest period to which life had lasted after the operation, Zesas,* as early as 1885, enumerated 129 cases of cancer, 31 of cicatricial stricture, and 2 of syphilis, and reckoned that among the first 16·2 per cent. were cured (?), among the second 55 per cent., and of those who eventually died, 17·2 per cent. survived the operation more than a year. If we take the operations made after the beginning of the antiseptic period (131), the results will be 19·5 per cent. and 68·7 per cent.

At the present time gastrostomy is in itself so little dangerous that it is always recommended as soon as the diagnosis has been made of a non-dilatable stricture of the cardiac orifice, with or without consecutive dilatation of the œsophagus. This operation alone can save the patient from imminent death from starvation. The chance of success of course depends on the nature of the stricture, but is all the greater if the operation be undertaken in the early stages of the disease, before the general health of the patient has been materially affected. It is in the nature of the case that it is powerless to save life. It, however, prolongs it, unless abnormal conditions intervene, and in cases of carcinoma the death of the patient is caused by the quicker or slower progress of the cancerous cachexia instead of by starvation. The psychological effect of the operation on the patient, the advantages of which you will readily comprehend, is one not to be despised; and the reproach made by a patient to Professor Kocher, "that he had made a hole in his stomach for no good," is certainly an exception to the general rule. Out of five patients to whom I have suggested the operation, one only, a Russian general, refused to submit to it. He would rather die in St. Petersburg than be operated on in Berlin!

---

* G. Zesas. Die Gastrostomie und ihre Resultate. Arch. f. klinische Chirurgie. Bd. xxxii. p. 188.

The following statements with regard to the operation I owe to the kindness of my colleague, Professor Sonnenburg, who operated upon two of my patients in the course of last year, and has lately published his experience on the subject.*

"When a fistula has to be created in cases of cancerous stricture, it is not always easy to ascertain exactly the position of the stomach, which is greatly contracted in consequence of an inadequate supply of food. It is best to make an incision, about 5—6 cm. in length, running parallel with the left costal arch, and at the distance of a finger's breadth from it, beginning under the xiphoid process and extending downwards in a slightly concave direction about as far as the ninth rib. After the skin, fascia and muscles have been divided, and the greatest care has been taken to stop all bleeding, the peritoneum must be opened, and can best be fixed by means of long loops of thread. While the thread is being drawn through, the omentum and intestines may be seen through the opening. If the cut has been made nearer to the median line, the opening will disclose the left lobe of the liver, which generally hinders the approach to the stomach. The stomach will best be found by passing the hand up to the cardia and starting thence to draw it out from the overlying intestines.

---

* l. c.

In the generality of cases, especially if the stomach be extremely contracted, it is difficult to distinguish between the stomach and the transverse colon ; but the colon may be recognised by its muscular bands, and the stomach by the course of the lower curvature and the vessels which enter there. But a highly atrophic condition will tend to obliterate these signs, which are otherwise easily recognisable, and this is more especially the case when there is much difficulty in drawing out the intestines. Cases have been known in which, in spite of the utmost care, the colon has been secured to the opening instead of the stomach. In suturing and fixing the stomach, care must be taken to make the opening in the stomach as near as possible to the cardiac orifice, as this alone renders it possible to provide the patient with a sufficient supply of food. The nearer the opening in the stomach is made to the pylorus, the more likely it is that the food injected will run out again through the fistula whenever the stomach moves forward, thus rendering it impossible to supply food to the patient. A small piece of the wall of the stomach, situated as high up as possible, must be drawn forward in the shape of a dome and stitched round to the parietal peritoneum by means of stitches which only comprise the serous coat, after which the peritoneum itself must be sewn to the fascia and muscles, but not to the skin. The opening of the stomach should, if possible, be deferred for a few days, and the wound filled with a plug of iodoform gauze until adhesion has taken place. At the end of two, or at most three days, there is no longer any danger of peritonitis caused by the entrance of the contents of the stomach into the abdominal cavity. The opening of the stomach is best effected by means of a pointed thermo-cautery. The opening should at first be quite small, as it will enlarge itself in a short time. Fluid nourishment is best introduced, to begin with, by means of a narrow œsophageal tube. To facilitate the finding of the stomach the practice has been recommended of introducing a fine sound, furnished at the lower end with an easily inflated ball. This is of course only possible when the stricture is in its earlier stages. The introduction of an effervescing powder, in order to inflate the stomach by the development of gas, is hardly possible in practice.

Many proposals and experiments have been made with regard to the apparatus which should be used for the injection of food. A very simple arrangement is, however, sufficient. As I have already said, a narrow œsophageal tube should be used, to begin with, for the passing of food through the fistula, and the orifice should be closed in the interval with a plug of wood or india-rubber. Later on a short, fine, silver canula is used permanently; to this an india-rubber tube, provided with a short funnel, is fastened, and by these means food is introduced. Many patients masticate part of their food, then pass it into a cup which is connected by means of the india-rubber tube with the canula in the stomach fistula."

Gastrostomy, unfortunately, does not remove the diverticulum or the dilatation of the œsophagus. The passage of food into the body is no longer hindered, but above the stricture there remains a hatching oven for all manner of putrefactive germs. The patient constantly swallows saliva; after the creation of the stomach fistula he will suffer very little from hunger, but in most cases he will be tormented by thirst. Small pieces of ice may be swallowed, and a little wine drunk in addition. The dilated œsophagus is thus filled with fluid which immediately undergoes a putrid decomposition, great *fœtor ex ore* results, and the patient brings up spontaneously or through the tube a fluid with the most offensive smell, which when examined under the microscope proves to be an almost pure culture of putrefactive organisms. Under these circumstances the sac must be washed out in the same way as the stomach is washed, for which purpose a disinfecting fluid may be used (salicylic acid, thymol, resorcin, borax, &c.), or salicylic acid or boric acid may be introduced in a solid form. I have also recommended teaspoonfuls of strong cognac for the antiseptic effect of the alcohol. In conclusion, I must say a few words on the subject of the food which should be injected.

The patient himself will soon learn by experience to prefer soft or fluid nourishment to any form of solid food. The functions of the stomach itself (except in cases of cancer, which we shall discuss later) being unimpaired, it is only necessary to consider the digestibility of the food in so far as it is advisable to supply any sick person with the greatest quantity of nourishment in the smallest and most convenient form, and to avoid all so-called indigestible food. For this purpose pure milk, pulpy and very soft food such as any kitchen can supply, raw or soft-boiled eggs, thick soups, made with wheaten meal, oatmeal, or fine flour, should be employed, to which may be added the lentil flour now offered for sale in great variety, which contains varying quantities of nitrogen, and the preparations of peptone, particularly meat peptone and peptone-chocolate. An appetising preparation of meat, almost of the consistence of syrup, can be made of very finely grated raw beef, stirred together with an egg, pepper, and salt. Kefir, a drink prepared from cows' milk, is a favourite form of nourishment with some patients, on account of its acid taste, while others quickly tire of it. In this it is no exception to all artificial preparations of food, one and all of which have the inevitable failing, that in the course of time they always become distasteful or even loathsome to the patient. We cannot play tricks with Nature, and if, for instance, she provides various forms of albumen but no pure peptone in ordinary food, we must bear the punishment in the loss of pleasant taste and its consequences if we try to substitute one for the other. In spite of the advertisements which extol the excellent flavour of various preparations, they all suffer from the same drawback, and a really and permanently palatable food-substitute has not yet been invented.

Starch flours, such as tapioca, arrowroot, and sago, are not to be recommended, first on account of the small quantity of nitrogen and of nutritive matter generally which they contain, and secondly because they render the diastatic action of the saliva necessary, and this passes in smaller quantities than usual into the stomach, being in fact secreted in smaller quantities because the stimulus to active secretion of saliva is absent where no solid food is masticated.

In a short time it becomes necessary to supplement the faulty supply of nourishment from above by means of another supply *per rectum*. Although feeding *per rectum* has been practised since the earliest days of medicine, Kussmaul, Leube, Rosenthal, and others have done good service by placing it on a scientific basis. The discovery that nitrogenous equilibrium could be maintained in animals by means of the injection of peptone and substances of the nature of peptone, *per rectum*, first inspired us with the necessary confidence in this manner of supplying nourishment. We have, however, been led away by false premises into believing that peptonised albuminoid substances are necessary. In a specially made series of experiments* I have proved that the injection of ordinary emulsified albumen answers the same purpose, and it is evident that the mucous membrane of the lower division of the intestines is capable of absorbing not only peptones but native albumens, and rendering them useful for the general assimilation of the body. In the estimation of the value of peptones it is a mistake to consider that the conditions are the same in the rectum and stomach, the fact being that there is a great and fundamental difference between the two cases; in the former we have to deal with a healthy mucous membrane, and in the second with one the functions of which are more or less impaired. In the one case, therefore, what we have to do is to lighten as far as possible the work of the organ with regard to the chemical alteration of food. In the other, that is to say, in rectal feeding, we have to deal with a healthy, active mucous membrane, and there is no necessity for doing part of the digestive work before the food is injected. We are never called upon to treat a case of diseased mucous membrane of the intestines by means of nutrient enemata, because in the very large majority of cases where the intestines are diseased the functions of the stomach are unimpaired; but if, by the greatest exception, it should happen that stomach and rectum were both affected and the question of artificial feeding were to be raised, feeding by the mouth would always afford the patient the best chance.

For these reasons I consider that peptones may be dispensed with in nutrient enemata. In no case is it necessary to follow the complicated method recommended by Leube, who advises that a certain quantity of chopped meat and fat should be mixed with fresh pig's pancreas, in the idea that the meat would be gradually peptonised by means of the latter ingredient. Nowadays we can use the preparations of peptone made for sale, which are, indeed, chiefly gelatine peptones, and consist for the most part of the preliminary stages, syntonin and propeptone, with only a small percentage of genuine peptone, but at any rate represent stages of transformation of the native albumen. For the purposes of greater convenience suppositories have been made from these preparations of peptone, but as I have said already peptone is quite superfluous. I have the food enema prepared in the following manner: two or three eggs are beaten with a tablespoonful of cold water. As much of the very best flour as will go on the point of a knife is boiled with a 20 per cent. solution of grape sugar, and a wineglassful of red wine added. The egg is then slowly poured in while the mixture is stirred, care being taken that the mixture is not hot enough to curdle the egg. The whole quantity will barely amount to ¼ litre (8 oz.). For practice among the poor, or in hospitals, from three to five eggs with about 150 cc. of 15 to 20 per cent. solution of grape sugar may be injected, or rather allowed to flow in. Later on we may add some solution of starch or mucilage to make the mass thicker, or a few drops of tinctura opii to alleviate any symptoms of irritation. A purifying enema of 250 cc. of lukewarm water or solution of common salt must precede the enema, and sufficient time must be allowed for the often repeated evacuations to be accomplished. Without this care it may happen that the food injected will be immediately returned. Enemata of this kind may be given two or three times a day, that is to say, divided into several portions. The fæces will probably assume in consequence a ribbon shape and be of a pale yellow colour. It is necessary to know this in order to avoid mistakes.

---

* C. A. Ewald. Ueber die Ernährung mit Pepton- und Eierklystieren. Zeitschr. f. klin. Med. Bd. 12, Heft 5 and 6.

Enemata of this kind may be used for a long time without irritating the bowel, only the precaution must be taken of letting the injected matter run in quite slowly through a soft nozzle, which has been passed as far as possible into the bowel, so that the funnel is barely two feet above the anal orifice of the patient when he is lying, or, in case a syringe is used, the piston or the india-rubber ball must be very gently pressed. For this purpose it is best to use a thick Nelaton's catheter, or an œsophageal tube with an opening in the lower end and numerous eyelets in the sides. The patient must remain for some time after the injection lying either on his back or on his side. In cases where the intestines are much irritated, a few drops of tincture of opium may be added to the injected matter, but this will soon become superfluous, and is very rarely permanently necessary. The india-rubber tampons, in the shape of dilatable bags, to be inserted into the bowel beyond the sphincter and then dilated with air or water, I have never found to be of permanent use in preventing the return of food. They cannot be passed further than the internal sphincter, and, after having resisted the pressure of the peristalsis of the intestines a few times, are of no further use, and by reason of the irritation which they cause to the mucous membrane, render the intestines more sensitive and intolerant to the injection than they would otherwise be.

In conclusion, gentlemen, we must determine what form of nourishment is best after the creation of a stomach fistula. The nature and quantity of food which can be taken, and should be recommended under such circumstances, depend primarily on the nature of the original complaint. The celebrated Canadian, Alexis St. Martin, appears to have had no difficulty in digesting the most substantial food supplied to him through the fistula. I myself have seen the boy with a cicatricial stricture of the œsophagus, who was operated upon by Trendelenburg, take bread and butter, meat, potatoes, and other vegetables, with evident satisfaction through the fistula,* and the man † operated upon by Verneuil could also take very sufficient quantities of substantial food. These, however, are all cases of a non-cancerous nature, in which the general health of the patient was relatively good, and in which too, earlier, the simplest and least irritating form of nourishment was introduced, and was only later replaced by more elaborate food. In such cases the digestive functions of the stomach appear to be little affected, but up to the present time no accurate investigations have been made into the subject. We must next inquire into the secretion of gastric juice and the peptic functions of the stomach, in cases where the creation of a fistula has been rendered necessary by cancer of the cardia, situated either above or below the opening. It is obvious that the nourishment supplied must depend entirely on the result of these investigations, and it is also clear that these belong, in part at least, to the general question of the condition of the peptic functions in cases of cancer of the stomach. I shall discuss these conditions in their proper order, when I come to speak of carcinoma of the stomach; for the present I will only anticipate so far as to say that in three cases where the operation has been performed, I have found no secretion of hydrochloric acid or of pepsin. In two of the cases, who died a short time after the operation, the non-secretion might be ascribed to the weakness of the patient; but the third, that of the lady mentioned above, who suffered from numerous cancerous metastases and carcinomatous stricture of the œsophagus, gives more important testimony. The contents of the stomach, which ran out through the fistula, were repeatedly examined, for the last time four months after the operation, at intervals of one hour, an hour and a half, and two hours after the patient had taken gruel with and without egg and a roll. Each time the ejected matter had undergone little change, was slightly mixed with mucus, gave a neutral reaction, contained no peptone, and when filtered had no digestive action with either pepsin or hydrochloric acid. In this case the secretive action of the glands had completely and permanently ceased. I must also remark that in the other cases, before the operation, while it was still possible to pass a tube into the stomach, the contents were found to be free from peptic secretion. Neschaieff * has made 105 examinations on four patients suffering from carcinomatous stricture of the œsophagus, with the like result with regard to the absence of hydrochloric acid. Riegel † found in two cases, in which, however, the position of the carcinoma is not exactly stated, and the stricture was still permeable, diminished or normal secretion of gastric juice, without any characteristic change in it.

---

* He masticated the food and then passed it out of his mouth into his stomach by means of an india-rubber tube.

† Mentioned by Ch. Richet. Du suc gastrique chez l'homme et les animaux. Paris, 1878, p. 88.

It is clear that under the conditions observed by me, it is necessary to abstain from all food except such as can be absorbed by the stomach, or as far as possible, and as quickly as possible, transmitted on to the bowel. Under conditions such as this, the various preparations of peptone are in their right place, and must be supplemented by carbohydrates and fat. The saccharifying action of the saliva will best be supplemented by its own product, grape sugar, or the patient can masticate his food

---

* Lancet, June 4th, 1887. It is not stated where the original of the work is to be found, and the question remains doubtful whether Neschaieff examined the contents of an œsophageal diverticulum or the contents of the stomach.

† F. Riegel. Beiträge zur Diagnostik der Magenkrankheiten. Zeitsch. f. klin. Med. Bd. xii. p. 434.

in order to mix it with saliva, and then pass it directly from the mouth into the stomach by means of a tube. In such cases the supply of nourishment depends entirely upon whether the functions of absorption and motion of the stomach are still intact, and according to this rule the "diet" of patients of this kind should be of typical simplicity, consisting only of peptone, solution of grape sugar, and a certain quantity of fat, were it not also necessary to consider the tastes of the individual and to satisfy the feeling of hunger. The patient whose case we are now considering masticated meat and rolls, and passed them through an india-rubber tube into the fistula, in the firm conviction that she was "providing something for the stomach." Happily for her, the stomach did not take what was offered to it, but passed it on at once to be disposed of by the intestines.

LECTURE IV.

ON STENOSES AND STRICTURES OF THE PYLORUS, MEGALOGASTRIA AND GASTRECTASIA.

Gentlemen,—I wish to show you a series of plaster casts of the stomach, which have been taken in the following manner: the organ was removed from the cadaver, its ends tied, and it was then distended with melted tallow. Moulds have been taken from the injections thus obtained, from which plaster casts have afterwards been taken.

A Munich artist, at the instigation of Herr v. Ziemssen, has made papier maché models of this kind, in which I can show you two specimens of enormous dilatation of the stomach; these models, however, only refer to pathological forms. The other eight, or rather the whole set of ten stomachs now exhibited, all of which belonged to persons of about the same size, who while they were alive complained of no disturbance of the digestive functions, will serve to convince you of the well-known fact that the stomach is subject to great variety both in shape and size.* Together with the ordinary sac form, we find stomachs drawn out almost into the shape of a sausage, and others which—as you will notice, without the influence of cicatricial stricture—have almost taken the shape of a biscuit or an hourglass, by means of a strong accentuation of the so-called antrum pylori, that is to say, the lower fourth, situated in front of the pylorus. The shape of the stomach does not offer more variety than its capacity, which in every instance has been measured by means of injection with water. The largest was found to contain 1,680 cc., the smallest only 250 cc. Between these two there is every possible variety of size.

You will gather from this demonstration that there is no absolute standard for the size of the normal stomach, at least within the limits just stated, and that its capacity by no means bears a definite relation to the size of the body. A very large stomach may belong to a relatively small person, and *vice versâ.* We can only speak of absolute dilatation of the stomach when its capacity exceeds the maximum of 1,660—1,700 cc. But the stomach may be absolutely much smaller, and yet relatively dilated for the individual to whom it belongs.

---

* Following Kussmaul's Clinical Lectures, this fact is insisted upon, for example, by v. d. Velden in his work "Ueber Vorkommen und Mangel der freien Salzsäure im Magensaft bei Gastrectasie. Deutsch. Arch. f. klin. Med. Bd. 23, p. 369.

There are, as Kussmaul and Rosenbach * have noticed, very large stomachs which exercise so little disturbing influence on the digestive functions, that they have only been discovered by chance, during the course of examinations for other purposes. I distinguish, therefore, between the large stomach or megalogastria, and dilatation of the stomach or gastrectasia, which again may be divided into an acute or subacute, and a chronic form. Megalogastria may lead to dilatation of the stomach, but is not in itself a pathological condition. The word refers to an anatomical condition, while dilatation is in its nature a disturbance of function, combined with a progressive anatomical process. Germain Sée † draws a distinction between simple dilatation, which may go on for a long time, or even for ever, without causing any functional derangement, and dilatation combined with dyspepsia, or what we commonly call dilatation of the stomach, meaning by this expression not merely a large stomach, but at the same time one whose functions have undergone a morbid derangement. By *dilatatio ventriculi* or gastrectasia, I understand that condition of the stomach which goes with the clinical symptoms of deranged activity of the stomach resulting from the dilatation of the organ; by megalogastria, that the stomach was congenitally large, or became so later in life, this abnormal anatomical condition being functionally compensated for. The "large stomach" may contract disease of a catarrhal nature, and the individual to whom it belongs become dyspeptic, but a patient of this kind is not suffering from gastrectasia in the clinical sense of the word, although he is more disposed to that disease than others. Megalogastria and gastrectasia are frequently mistaken for each other. Insufficiency of the stomach, to anticipate this subject, is quite a different thing, which may, and often does lead to the symptoms of gastrectasia, but which is a functional derangement of the organ, not founded on the anatomical basis of dilated stomach, and which may occur in stomachs of the most various size.

---

* O. Rosenbach. Der Mechanismus und die Diagnose der Mageninsufficienz. Volkmann's Sammlung, 153, p. 8.

† Germain Sée. Du régime alimentaire. Paris, 1877, p. 280.

The following diagnostic aids may be employed for the discovery of the dilated stomach :—

1. *Inspection.*—In cases where the abdominal walls are thin or relaxed, it is common to see the *regio hypochondriaca sinistra*, and a greater or smaller portion of that part of the *regio hypochondriaca dextra* which lies to the right of the median line, stand out in proportion to the distention of the stomach by means of air or ingesta, in the shape of a hemisphere or balloon, beginning immediately under the costal arch. The lower arc of this circumference cuts through the median line on a level with the umbilicus, or slightly lower down between the symphysis and the umbilicus. Sometimes only the lower part is distended, and there is a furrow-like depression between it and the costal arch, which is generally caused by the long axis of the stomach taking a more or less vertical position, but which may also occur when the smaller curvature has doubled up while the fundus is distended, that is to say, filled with ingesta. In the first case, the smaller curvature will run parallel with the vertebral column, either in the median line or to the left of it, and in the advanced stages of this condition will only turn to the right at the level of the umbilicus, so that the pancreas even may be felt between the stomach and the liver, being thus liable to be confounded with a tumour of the stomach. Peristaltic waves in regular succession, or caused by mechanical irritation from without, may pass across the stomach from left to right, while antiperistaltic movements too may make their appearance (Bamberger,* Cahn,† Glax‡). If the stomach is distended with air this process may be traced still more clearly, and the gradual distention of the organ will present a very characteristic appearance. In advanced stages of gastrectasia the body is generally, though not always, devoid

---

* Bamberger. Krankheiten des chylopoetischen Systems. Erlangen, 1855, p. 325.

† A. Cahn. Antiperistaltische Magenbewegungen. D. Arch. f. klin. Med. Bd. 35, p. 402—407.

‡ A. Glax. Ueber peristaltische und antiperistaltische Unruhe des Magens. Pester med-chirurg. Presse, 1884.

of fat, the abdominal walls are relaxed and slightly depressed, while the false ribs are arched upwards on the left side. The skin is dry, pale, and somewhat earthy in colour.

2. *Percussion.*—It is advisable, in cases where there is any suspicion of dilatation of the stomach, to inflate the organ with air (*vide* Lecture II. p. 268) before beginning to percuss. My attention has lately again been called to the importance of using a spray producer for this purpose, instead of evolving carbonic acid gas. One of my colleagues failed to discover a serious dilatation, which extended as far as half-way between the umbilicus and the symphysis, in spite of having given an effervescing powder to the patient, and this failure was no doubt owing to the fact that the gas was not developed in sufficient quantities for the size of the stomach. The resonance above the inflated stomach is always tympanitic, and its pitch depends upon the contents of the stomach and the tension of its walls. If the transverse colon be strongly inflated, and lie close to the curvature of the stomach, it may, under certain conditions, give the same note as the stomach, thus rendering it impossible to draw an accurate line between the two organs by means of percussion. In this case the stomach must be filled with fluid before percussing, in order to fix the limits between the dulness of the stomach and the resonance of the colon, or a greater supply of air must be pumped into the latter per rectum, to produce at the same time a change of position and a higher tympanitic resonance. I must remind you, however, that the finer distinctions of pitch may often be distinctly traced by the auscultation of immediate percussion, when the ordinary method of percussion with a pleximeter is of no avail, and this method of proceeding should therefore be made use of in doubtful cases.

Ferber* has drawn attention to the fact, that the tympanitic resonance of the circular space which is formed by the stomach below the lower border of the left lung gradually shades off when the stomach is in a normal condition, behind the axillary line, but in cases of dilatation may be traced as far as the vertebral column. But it is evident *a priori* that this condition is essentially dependent upon the amount of gas and of ingesta contained by the stomach and intestines, by which the organ is more or less pushed into the cavity of the diaphragm, so that this tympanitic zone may, and indeed under favourable conditions does, extend to the vertebral column even when the stomach is of a normal size. The following method recommended by Dehio* for determining the limits of the stomach under normal and pathological conditions is, so far as my experience goes, far more to be recommended. The patient must drink at intervals on an empty stomach four quarter litres of water, so that he takes a whole litre in four portions.

---

* Ferber. Ein Beitrag zur Magenpercussion, &c. Deutsche Zeitschr. f. prakt. Med. 1876, No. 42.

If after each quarter litre has been taken, the limits between the lower semicircular dulness and the distended transverse colon be clearly ascertained by means of percussion, these limits may, in a healthy patient when he is in a standing position, be seen in proportion to the fluid poured into the stomach, to advance downwards to about a few centimetres above the umbilicus, but never below it. When the patient is lying down, tympanitic resonance, caused by the air which is swallowed at the same time as the water, takes the place of the dulness, and this prompt change of sound is a certain proof that we have to do with the stomach and not with the bowel. This method enables us at the same time to recognise the condition which we have not yet discussed, of motor insufficiency or atony of the stomach, that is to say, the temporary dilatation which so often leads to permanent dilatation of that organ. It is evident that the more the wall of the stomach is relaxed, the sooner will small quantities of fluid make the lower border of the stomach reach the lowest level, while in pronounced cases it will be found already to be at an abnormally low level. Necessary conditions for examinations of this kind are that the intestines, and particularly the transverse colon, should be capable of containing air, that there should be no abnormal configuration of the stomach, and finally that the abdominal walls should not be so thick as to impede the finer distinctions of sound.

In conclusion, gentlemen, in order to provide you with definite facts with regard to the normal size of the stomach, or in more correct language, to give you the size of that organ when projected towards the abdominal wall, and moderately filled with air, I will quote the results obtained by Pacanowski* in a most careful series of eighty-one examinations, fifty-five in men, and twenty-six in women. He found, in accordance with the results of earlier experiments—for instance those of Wagner—that the lowest limit of the stomach in the left parasternal line is generally situated in men at the distance of three to five cm. above the umbilicus, in women at the distance of four to seven cm. above. The difference between the highest and lowest point of the tympanitic resonance of the stomach was found to be eleven to fourteen cm. in men, and about ten cm. in women; the width of this zone was in the one case twenty-one, in the other eighteen cm. But Pacanowski, in accordance with the facts adduced at the beginning of this lecture, with regard to the great variety that is to be found in the size of the normal stomach, noted considerable deviations from these averages, as, for instance, nine cm. and twenty cm. for the length, sixteen and twenty-five cm. for the width, without being able to prove the existence of pathological conditions, so that we have here another proof that the absolute size, as far as it can be ascertained by means of physical methods of examination, can only be used for the diagnosis of dilatation of the stomach in cases where that dilatation is excessive. For it may easily happen that an originally small stomach may acquire a pathological dilatation, with the clinical symptoms resulting therefrom, yet still keep within the limits which are considered to be normal.

---

* Dehio. Zur physikalischen Diagnostik der mechanischen Insufficienz des Magens. Verhandl. des vii. Congresses f. innere Medicin, 1888.

3. *Palpation.*—We will here merely mention the palpation of tumours of the pylorus, and enter into details on the subject later on. Leube recommended "palpation by means of the point of the sound" for the discovery of dilatation of the stomach. A stiff sound should be passed as far into the stomach as can be done, without the use of great force, till it is stopped by an obstacle. If the point of the sound can be palpated below the line of the umbilicus, dilatation of the stomach is thereby proved. This method has been objected to, firstly, because it is considered dangerous, and secondly, because it is often impossible to palpate the point of the sound. Leube has confuted both objections, and with regard to the first I entirely agree with him.

---

* H. Pacanowski. Beitrag zur percutorischen Bestimmung der Magengrenzen. Deutsch. Arch. f. klin. Med. Bd. 40, p. 342.

It would require a most unusual degree of clumsiness to perforate the wall of the stomach, but it is quite another matter to feel the point of the sound through the abdominal walls. It may easily be done in the advanced stages of dilatatio ventriculi, in which the abdominal walls are relaxed and fallen in, but when this is the case other methods of examination will lead to a correct diagnosis. In the case of a comparatively well-nourished person it is generally quite impossible to feel the point of the sound through the abdominal walls, even if every quarter inch of space is gone over with the greatest possible care. In experiments on the cadaver too, it has often happened that I could by no means reach the lowest part of the stomach with the point of the sound, which usually caught in an obstruction situated higher up, pushed the obstruction a little way down, and remained fixed far above the lowest point. We must also take into consideration the fact that the stomach of a man often takes a vertical position, and that, as was known as early as in the days of F. Meckel, this is still more frequently the case with women, a condition which may be either a congenital displacement, or the result of pressure, traction, &c. The smaller curvature will then have an almost vertical position, and the pyloric part of the fundus may extend below the umbilicus. This position may be not so unfrequently observed in the cadaver, without the capacity of the stomach being greater than normal. It is probable that this is the position of the stomach of a performer, described by Virchow at a meeting of the Berlin Anthropological Society,* who is capable of swallowing the blade of a dagger seventy cm. in length. When the cardiac orifice sinks down towards the right side, and the pylorus remains in its place, considerable depression may be caused in the position of the greater curvature, by the smaller curvature being bent to an acute angle. For all these reasons palpation with the sound will never give trustworthy results; as Allbutt † remarks, "in my opinion, palpation with the point of the sound is not necessary when the abdominal walls are thin, while in stouter persons the instrument cannot be distinctly felt."

4. *Auscultation.*—If a series of short taps, following each other in quick succession, are made with the flat of the hand on the abdominal wall, in the region of the stomach, or if the whole body be shaken, slapping sounds of slightly metallic tone, the

---

* Meeting of July 17th, 1886.

† l.c.

so-called succussion or splashing sounds, the "clapotement" of the French,[*] may be heard, either at a distance or by the stethoscope. These sounds are in themselves of no pathognostic importance. They may come from the transverse colon as well as from the stomach, and frequently occur under quite normal conditions, immediately after a somewhat large quantity of fluid has been taken, when they can be easily produced by short energetic contractions of the abdominal muscles. They are only pathognostic, (1) if they exist some time after the fluid has been taken, and (2) if they can be proved to come from the stomach. Under certain conditions the only means of obtaining this proof is to empty (siphon) the stomach completely. If the succussion sounds continue, they must originate in the intestines. This circumstance is frequently forgotten, and a diagnosis of dilatation of the stomach is made without further inquiry, on the ground of the existence of succussion sounds. Only thus can the fact be explained that certain French authors (Bouchard and others), not only find dilatation of the stomach in almost every patient suffering from dyspepsia, but Bouchard goes so far as to find it in thirty per cent. of persons suffering from all diseases, an exaggeration which, however, is not shared by sober-minded observers, such as Germain Sée, and Dujardin-Beaumetz. After Penzoldt,[†] Pauli was the first to call attention to a bubbling sound in the stomach, something like the noise made by an uncorked bottle of seltzer water, which may be occasionally heard by means of auscultation in the region of the stomach when energetic processes of fermentation are going on. Noises of another kind are those called by Kussmaul[‡] the rattling or crackling sound, which as I said above may be produced in many persons, with, or without, dilatation of the stomach by an active contraction of the abdominal muscles, or by a quick series of compressions applied from the outside while the patient is passive. In contradistinction to the splashing sound these noises are most easily produced in a standing position.

Sometimes one hears, even at a distance, the metallic heart sounds over the air-distended stomach. Strümpell* gives an account of noises which could be heard at a distance, and which occurred simultaneously with respiration, in the case of a patient suffering from dilatation of the stomach. The immediate percussion note has a metallic character on auscultation, and under favourable conditions may be used for ascertaining the limits between the organ and the coils of intestine (Leichtenstern).

---

[*] Andhui. Du bruit de flot ou de clapotage de l'estomac comme signe de dilatation de l'estomac. Gaz. des hôpit. 1883, No. 47.—Girandeau. De la dilatation de l'estomac. Arch. générales de méd. 1885, p. 342. Duplay first called attention to the subject in France in the year 1833.

[†] Penzoldt. Die Magenerweiterung. Erlangen, 1877.

[‡] Kussmaul in Volkmann's Samml. klin. Vorträge, No. 181, ausg. 16 Juni, 1880.

The noises made in swallowing cannot be utilised for the diagnosis of dilatation. I have never been able to discover any characteristic changes in them, although I have looked for them in every available case.

Rosenbach has contrived a method, founded on the auscultation of air blown into the stomach through a tube. If a certain quantity of water be poured into a healthy stomach, and the tube passed so that its lower end reaches below the surface of the water, when air is injected moist, coarse râles and metallic tinkling will be heard on auscultation, which sounds disappear as soon as the opening of the tube has been gently drawn up above the surface of the water. By these means the surface of the water is proved to be at exactly the spot where the sounds cease. When the surface of the water has been thus defined, if a further quantity of water is poured into a healthy stomach, the level of the water will rise considerably, but where there is dilatation the alteration will be but slight. This method is very difficult to carry out in practice, and, like Leube's method of palpation with the sound, is unnecessary for the discovery of large dilatations, and useless in cases where they are small.

5. *Mensuration of the stomach.*—The level of the greater curvature may be measured by the number of centimetres to which a stiff sound may be passed into the stomach without encountering an obstacle. Penzoldt reckons that under normal conditions the sound may be passed to the length of sixty cm., counting from the incisor teeth, and that the length to which it may be passed never reaches the length of the vertebral column, but in three cases of dilatation of the stomach it was passed to the length of seventy cm., thus equalling the length of the vertebral column. Even if we disregard the important facts already mentioned, that it is quite uncertain whether the point of the

---

* Berl. klin. Wochenschr. 1879, No. 30. Aus den Sitzungsberichten der med. Gesellschaft zu Leipzig.

sound reaches the lowest part of the stomach, and whether the organ has not taken a vertical position, the great variety which we have already proved to exist in the size of the stomach, renders it impossible to reckon accurately the normal length to which the sound may be introduced. We will not pause to discuss such methods as the inflation of an india-rubber ball passed into the stomach (Schreiber) or the manometer test of Purgecz, but examine in conclusion how far measurement by filling the stomach with water is available for purposes of diagnosis. In order to do this the stomach must be filled as far as possible, and then completely emptied, but—when is it full? To ascertain this we must rely upon the statements of the patient, who, in most cases, feels distinctly when the stomach begins to be full, or else we must wait till the superfluous quantity of water is ejected. Neither of these signs is absolutely reliable, because the moment referred to varies according to the sensitiveness of the patient, while the capacity of the stomach varies so greatly in different individuals, and even in the same individual at different times. We can only speak with certainty of an absolutely large stomach when it is proved to be capable of containing more than 1,500 cc.

The ætiology of dilatation of the stomach.—Dilatations of the stomach arise from two causes—the first, mechanical contraction of the pyloric opening; the second, absolute or relative weakness of the expulsive power, that is to say, an atonic condition of the muscular wall. It is evident that when the functions of the stomach are in their normal condition, the contents, the action of the muscles, and the power of resistance offered by the pylorus, stand in due relation to each other, and that any change in either of these factors must lead to a derangement of function, which, in most cases, will cause dilatation of the organ. But these due relations may be maintained in spite of abnormal changes in particular functions, by means of a compensatory adjustment, which, so long as it continues, will prevent the appearance of functional derangements, just in the same way as in disease of the heart disturbances in the circulation will only occur when there ceases to be sufficient compensation for the valvular defect. Oser[*] has founded his remarks on dilatations of the stomach upon this explanation, which we also may accept. Hypertrophy of the muscular coat is at the disposition of the organism as a compensation for disorder, but it is necessary to remark that this hypertrophy of the muscular coat rarely takes the character of a perceptible thickening, and, in most cases, is not noticeable at all, because the individual fasciculi are stretched out and flattened by the dilatation of the organ. But if you consider what the stomach would be like if reduced to its normal size, without a corresponding diminution in the fasciculi, you will see that the muscular layers have increased to a very considerable extent.

---

[*] L. Oser. Die Ursachen der Magenerweiterung. Weiner med. Klinik. 1881, No. 1.

In order to gain a satisfactory insight into the nature of dilatation of the stomach, it is necessary to bear in mind that under these conditions we have to do with a consecutive process, with a symptom, and not with a genuine form of disease, and that it may arise from the utmost variety of causes, if these causes fulfil the conditions which we are about to discuss. But the collective symptoms of dilatation of the stomach, when once developed, are, in comparison with its varied ætiology, so uniform, and so clearly defined, that they occupy our whole attention, and throw the original pathological departure more or less into the shade. For this very reason we are especially called upon, in every case of dilatation of the stomach, to inquire most carefully into the cause, because this knowledge of the cause will exercise an essential influence upon the prognosis. It depends upon the nature of the original factor whether the conditions are transitory or permanent, the derangements curable or incurable, and it will be necessary, as I said at the beginning of this lecture, to distinguish between functional and organic dilatation, that is to say, between such forms of dilatation of the stomach as are not necessarily followed by a material lesion of the motor apparatus and its nerves, and which thus may eventually lead to involution, and those other forms where the conditions exclude this possibility because a series of degenerative processes have been developed in the wall of the stomach. It results from this, too, that functional dilatations may sometimes occur and are invariably of comparatively short duration, so that, if they present the generally accepted symptoms of dilatation of the stomach at all, these symptoms are merely transitory; in most cases they take the course followed by the dyspeptic conditions proper to the underlying diseases, chronic gastritis, atony, and neuroses. I shall, therefore, have to consider these functional or curable dilatations when I come to speak of the above-named affections.

It is, however, evident at a glance that there is no hard and fast line to be drawn between these two groups, but rather that the first can and will pass into the second, if the conditions persist which are the original cause of the disease.

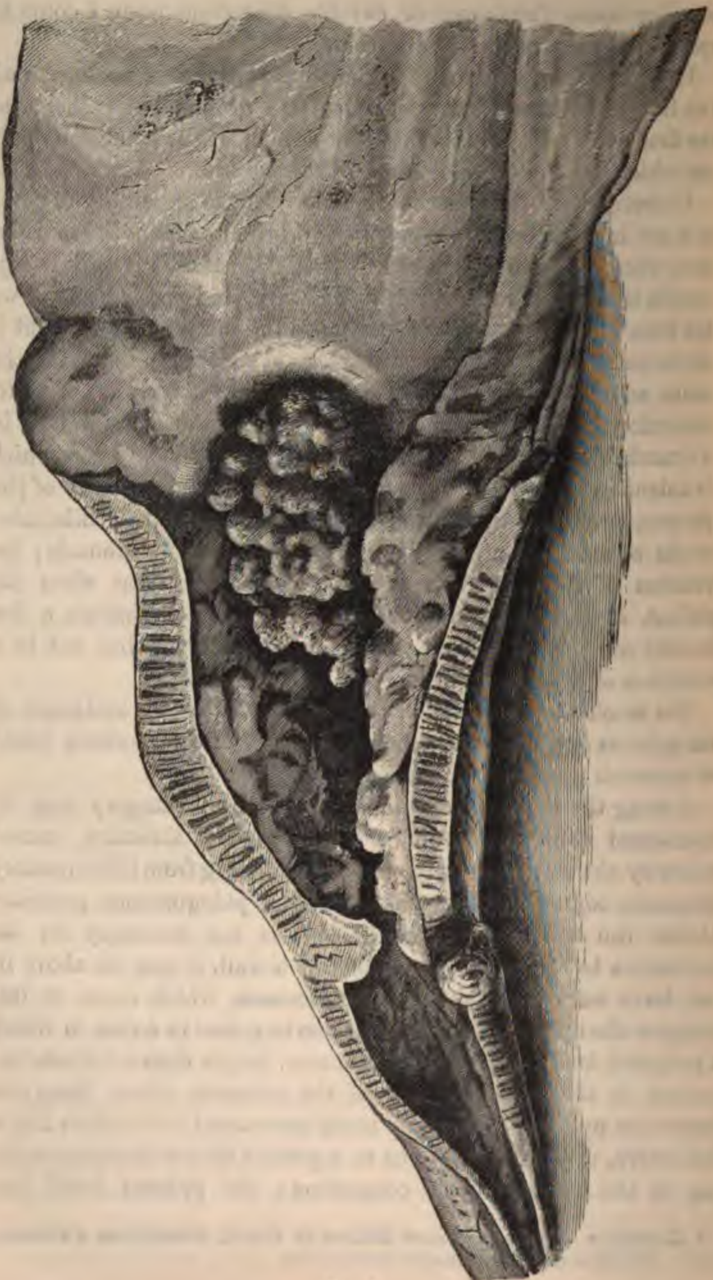
Unfortunately the latter is the rule. In the generality of cases it is not in our power to remove the original cause of the malady, even when we have discovered it, partly because it is only recognisable in a comparatively advanced stage, and partly because we are from the first powerless to remove the motive factor. But if the latter should be the case, if we should succeed in removing the cause, and if the dilatation be stopped before it becomes organic, involution is then possible. This seems to me to be proved in a remarkable degree by a case mentioned by Klemperer, which is unique in literature.* It runs thus: cicatricial stricture of the pylorus, produced by hydrochloric acid; consecutive dilatation of the stomach (contents 2½ litres); operation for stenosis; involution of the dilatation of the stomach; so that when the patient, a man thirty-five years of age, died of phthisis a few months after, his stomach was found to be large, but not in a condition of actual dilatation.

The mechanical factors which lead to stricture or occlusion of the pylorus are situated either in the wall of the stomach itself, or encroach upon it from outside.

Among the most usual causes in the first category may be mentioned cancerous growths and cicatricial stricture, caused either by the cicatrisation of an ulcer, or arising from inflammatory processes connected with an ulcer or a phlegmonous gastritis. Under the first-named conditions it is not necessary for the carcinoma to encircle the pylorus like a wall, it may lie above it, but have wart-like polypoid excrescences, which more or less obstruct the opening, as I had occasion to notice in a case in which a polypoid and highly vascular tumour, larger than a walnut, had formed in the posterior wall of the stomach, about three cm. above the pylorus, and which must have acted *intra vitam* like a ball valve, closing the pylorus to a greater or less degree according to the amount of its congestion; the pylorus itself was

---

* Klemperer. Verein für innere Medicin in Berlin, Sitzung vom 4 Februar, 1889. Deutsche med. Wochenschr. No. 9, p. 170.



somewhat contracted, but not sufficiently so to hinder the passage of the little finger. (See fig. 9.)

Bernabel * mentions a similar case, which, however, was distinguished by the formation of genuine pedunculated polypi. The largest of these was from six to eight cm. long, and had formed on the anterior wall of the stomach, five cm. above the pylorus. Cruveilhier† gives a drawing of a tumour, about the size of a potato, situated in the duodenum just below the pylorus, which must have had the same effect as an actual pyloric stenosis. The case of obstruction described by Pertik ‡ is probably unique of its kind. A diverticulum, shaped like the finger of a glove, had formed in the duodenum on the level of the Pacinian papilla, and in proportion as it was filled with chyme from the stomach, must have hindered the passage of the chyme through the duodenum.

The congenital contraction described by Landerer § and R. Maier, ‖ also comes under the heading of mechanical contraction. It can take the form of a simple, sometimes round, at other times slit-like contraction of the ostium pylori, or the muscular wall of the pylorus may be hypertrophied, and the pyloric part of the stomach may assume a ball-like or plug-like appearance, so that in the latter case it bulges into the duodenum like the cervix uteri. I must remark in passing that this hypertrophy must be distinguished from that form produced by chronic catarrh of the mucous membrane. It is evident that contractions of this kind may lead to the development of dilatation, so soon as the expulsive powers of the pyloric portion are no longer sufficient to overcome them, that is to say, when the *antrum pylori* passes from the stage of hypertrophic compensation to that of incompetency. The time at which this happens depends naturally on the constitutional condition of the individual. While in cases such as this the obstruction to the emptying of the stomach is easily explained, there are others in which a *post-mortem* examination has proved the pylorus to be unobstructed, and yet there has been dilatation of the stomach for which the absolute or relative muscular insufficiency, which we are about to discuss, could not sufficiently account.

---

* Bernabel. Contribuzione al etiologia del vomito mecanico da polypo gastrico. Rivist. clin. di Bologna, 1882.

† Cruveilhier. Anatomie pathologique du corps humain. livr. 4, pl. .

‡ O. Pertik. Beitrag zur Aetiologie der Magenerweiterung. Virchow's Arch. Bd. 114, p. 437.

§ Ueber angeboren Stenose des Pylorus. Inaug.-Diss. Tübingen, 1879.

‖ R. Maier. Beiträge zur angeborenen Pylorus-stenose. Virchow's Arch. Bd. 102, p. 413.

Kussmaul * has shown, by experiments on the cadaver, that when the abdominal walls are greatly relaxed, rotation of the distended stomach may cause the pylorus to take an antero-posterior position, and at the same time so twist and compress the *pars horizontalis duodeni* at its point of departure from the stomach that not a drop of fluid can pass from the stomach into the duodenum. When the stomach is full and its ligaments give way so that it drags the horizontal portion of the duodenum down with it, the lumen of the bowel may be occluded by a kink, not at the pylorus, but somewhat lower down, at the junction of the *pars horizontalis* of the duodenum with its descending portion. The pylorus is then to a certain extent drawn down and narrowed into a slit, so that the peristalsis of the stomach has the greatest difficulty in overcoming the obstacle which it meets with, or perhaps it does not succeed in doing so at all. If there should be at the same time stenosis of the pylorus, ampulliform dilatation of the duodenum may accompany dilatation of the stomach, as may be typically seen in the accompanying drawing, taken from a description by Cahn, † which gives at the same time a good representation of the position of the stomach in cases of extreme dilatation. (See fig. 10.)

The condition about to be described may perhaps be looked upon as an additional factor in causing dilatation of the stomach. While under ordinary conditions the pylorus is only separated from the duodenum by a slight constriction, and has no perceptible boundary towards the stomach, sometimes a regular ring is found, so that when the stomach is opened it looks as if a cord had been drawn underneath the mucous membrane. There results from this a small expansion on the side of the pylorus towards the stomach, which, when the pylorus is closed, may easily develope under the pressure of food into a regular dilatation. In order to produce this, it is necessary that the pylorus should be closed with unusual firmness, in fact there must be spasmodic contraction before it is possible. This leads me to speak of spasmodic contraction of the pylorus, the only condition inside the stomach which I have not yet mentioned, which is said to produce dilatation. Sanctuary* has made an autopsy in a very instructive case of this kind. The pylorus was patent, but above it there lay an oval ulcer, two and a half inches long and one inch wide, surrounded by normal mucous membrane, the irritation of which ulcer, by the movement of the chyme, evidently caused violent contraction of the whole pyloric region.

---

* l.c.

† Cahn. Ueber antiperistaltische Magenbewegungen. D. Arch. f. klin. Med. Bd. xxxv. p. 414.

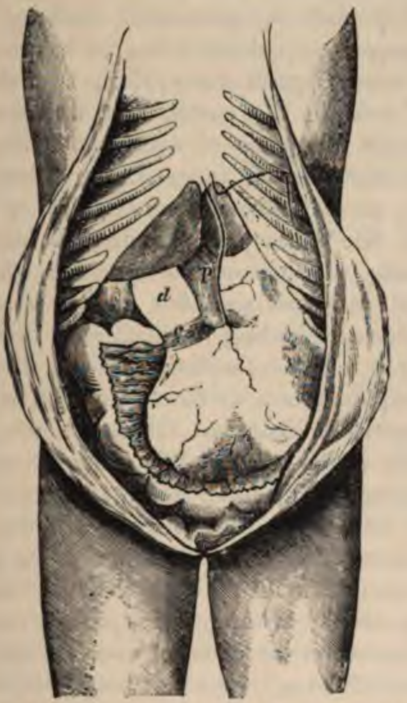


Fig. 10.—Distance of the greater curvature from the symphysis = 4 cm.; portion of the œsophagus in the abdominal cavity = 4 cm.
Lesser curvature 10 cm. long.
(*c*) Cancerous mass.
(*p*) Pancreas sunk down to the second lumbar vertebra behind the small omentum.
(*d*) Horizontal part of the duodenum, the pars verticalis of which reaches to the pelvic brim.

---

* Sanctuary. Notes of cases of dilated stomach, with remarks. Br. Med. Journ., 1883, p. 613.

While the patient was still alive, distinct dilatation of the stomach was noted. But of all the causes which have been given to account for dilatation, in cases where there is no tangible stricture of the pylorus, spasmodic contraction seems to me the least credible. Spasmodic stricture must necessarily be intermittent and not continuous, and it is therefore impossible that it should present any permanent obstacle. According to our present experience, which seems to be pretty universally recognised as correct, spasm of the pylorus is produced by superabundance of acid in the contents of the stomach, so that according to this, all cases of excessive acidity should lead eventually to dilatation of the stomach, which undoubtedly, so far as our present knowledge extends, is not the case. But Germain Sée* has lately expressed his opinion that there is a definite causal connection between excessive acidity, that is to say, increased secretion of hydrochloric acid, and atony of the stomach, leading to dilatation. Yet the instances quoted by him do not take the form of acute dilatation with its recognised symptoms, but, so far as they go, come under the heading of functional dilatation. It is, however, quite possible that the condition of the pyloric ring already mentioned may, in cases of spasm of this kind, be an important factor in the occurrence of dilatation. But if we admit that this kind of spasmodic closure of the sphincter can ever be permanent, the natural consequence is that it must lead in time to a kind of functional hypertrophy of the pyloric sphincter, and to this condition must be traced the cases of so-called idiopathic hypertrophic stenosis of the pylorus which are recorded in literature. A case of this kind, which has been carefully studied with a view to the final result, has been published by Nauwerk.† A girl, aged twenty-three, had been suffering for ten months from slightly dyspeptic symptoms. She swallowed some cherry stones, after which there were symptoms of pyloric obstruction, continuous and uncontrollable vomiting, and obstinate constipation. At the end of three months she died. The muscular wall was found to be seven mm. thick at the pylorus, the mucosa from four to five mm., the serosa two mm., while the pylorus was perfectly patent. Neither to the naked eye nor microscopically could any neoplasm be ascertained to exist. Ten cherry stones were found in the stomach, which was dilated to an enormous extent. From our modern standpoint, this would be looked upon as hypertrophy caused by hypersecretion of acid.

---

* Germain Sée. Hyperchlorhydrie et atonie de l'estomac. Bull. de l'acad. de méd. Séance 1 Mai, 1888.

† Nauwerk. Ein Fall hypertrophischer Pylorusstenose mit hochgradiger Magenerweiterung. D. Arch. f. klin. Med. Bd. xxi. pp. 573—580.

The causes situated outside the stomach which may lead to stenosis or closing of the pylorus, are tumours, which either press upon the duodenal opening of the stomach, or spread and grow around the duodenum. In this case they originate either in the pancreas, the omentum, the retroperitoneal glands, or the liver. A rare occurrence of this kind is reported by Minkowski,* who had the opportunity of observing a hard tumour, mistaken during the lifetime of the patient for cancer of the pylorus, which was combined with dilatation of the stomach, and who found, on making a *post-mortem* examination, that the gall-bladder, distended by a large gallstone, had almost entirely compressed the pylorus and occasioned the enormous dilatation. In this case examination for hydrochloric acid would have led, although, as we shall see later, not positively, to the exclusion of the idea of carcinoma; but at any rate it is sometimes impossible to fix the limits between tumours of the liver, or of the gall-bladder or gallstones, and tumours of the stomach. The results of inflammation in the abdominal walls, forming cicatricial bands, which encircle the pylorus or compress it against the posterior abdominal wall and lead to traction and flexion of the pylorus or of the horizontal portion of the duodenum, also produce stenosis of the pylorus. Rokitansky † observed dilatation of the stomach causing traction and dislocation of the organ (and flexion of the duodenum ?). Bartels first called attention to the simultaneous appearance of movable kidney on the right side, and dilatation of the stomach, and attributed the latter to the pressure of the movable kidney on the stomach, but he considered that the dilatation was not likely to become serious unless it began in childhood. Malbranc ‡ agrees with him in his views, and Schütz §

---

* C. Minkowski. Ueber die Gährungen im Magen. Mittheilungen aus der med. Klinik zu Königsberg, 1 and 2, p. 163.

† Rokitansky. Handbuch der pathol. Anatomie. Bd. ii. p. 178.

‡ Malbranc. Ein complicirter Fall von Magenerweiterung. Berl. klin. Wochenschr. 1880, No. 28.

§ E. Schütz. Wanderniere und Magenerweiterung. Prager medicin. Wochenschr. 1885, 14 Jan.

observed a case in which a woman was cured by leaving off stays which had probably pressed upon the dislocated kidney. Litten, too, quite recently has laid stress on the connection between diseases of the stomach and displacement of the right kidney,* and has observed in fifty-five per cent. of his cases the simultaneous appearance of displacement of the right kidney and dilatation of the stomach. He, in common with Bartels, looks upon the dilatation as secondary and the movable kidney as the cause, but I should wish to express my agreement with Oser, Nothnagel, and Leube,† who maintain that in the majority of cases there is evidently no question of cause and effect, but a simple coincidence. Besides which it is necessary for the consideration of this question to distinguish between a merely palpable and a genuinely movable kidney. Out of seven cases of movable and dislocated kidney on the right side, that is to say, genuine movable kidney, which Brentano was able to collect in the course of a few weeks at the policlinic of the Augusta Hospital, three women were suffering from dilatation of the stomach, while out of twelve cases of simply palpable kidney only one was found to be without dilatation. I can corroborate the statement that a movable kidney on the right side and dilatation of the stomach frequently occur in women, and indeed more often than in men, but I cannot on that account agree with Bartels, who believes that the kidney is pressed down by the liver when a deep inspiration is made, that a contraction of the lower half of the thorax takes place at the same time, and that the duodenum is pressed in between the liver and the kidney. In order to make this possible the kidney must be fixed; but its mobility is the special characteristic of the complaint, it gives way under pressure, and it is only necessary to observe in animals the energy with which the contents of the bowel are pushed onwards to see how easily an obstacle of this kind may be overcome.

In my opinion, Landau ‡ is right when he calls attention to the fact that there are physical reasons why the kidney cannot exercise the necessary amount of pressure on the bowel.

The second great group of dilatations of the stomach results from *weakness in the muscular wall* of that organ, and is distinguished from those already mentioned by the fact that as a rule the stomach is but slightly dilated, and there is no hypertrophy of the muscular coat. We distinguish this condition as *atonic gastrectasia*, resulting from asthenia or atonic paralysis of the motor nerves of the stomach.[*] The causal factors are, first, *impaired muscular tonus*, either in consequence of strain (and perhaps injury ?) of the muscular fibres, with gradual relaxation or insufficient nourishment of the contractile elements of the wall of the stomach from anæmia, chlorosis, disease of the nerves, exhausting acute and chronic diseases, peritonitis, and amyloid degeneration of the vessels. For this reason chronic gastric catarrh is reckoned among the causes which produce dilatation of the stomach. As the ingesta in consequence of the catarrhal condition remain longer than usual in the stomach, there results overloading of the organ, combined with relaxation of the muscular wall, which finally, as we shall see later under the heading of atrophy of the stomach, conduces to the separation of the fibres of the submucosa and muscularis, and the formation of a retiform tissue, the result of which is dilatation, in the same way as a urinary bladder suffering from catarrh undergoes at last paralytic distention. In this sense we must understand Clozier [†] when he reckons faulty hygiene in combination with a chiefly upright position of the body among the causes of dilatation of the stomach.

---

* Proceedings of the Congress for internal medicine. Wiesbaden, 1887, p. 223.

† Proceedings of the same Congress, p. 225.

‡ Landau. Die Wanderniere der Frauen. Berlin, 1881, p. 44.

Excessive tension of the walls of the stomach is not only caused by loading the stomach with improper quantities of solid matter, with which the muscular coat is unable to cope, but also by the abnormal development of gases in the stomach while the orifices are closed; this closure may be originally of a mechanical nature, and arise from one of the above-mentioned causes, or an abnormal fermentation of the ingesta may be developed primarily, which leads to muscular insufficiency. The experiments made by Miller [‡] have shown, and everyday experience confirms the fact, that these primary fermentations always arise where there is a disproportion between the exciters of fermentation introduced into, or already existing in, the stomach, and the amount of hydrochloric acid secreted, which under normal conditions acts as a check to fermentation, either where there is excess of fermentative organisms with normal secretion of hydrochloric acid, or too little hydrochloric acid secreted to check them. The absorbed products of fermentation from the bowel, where we are most familiar with them, have an irritative action on the muscular coat, giving rise, so long as its power of contraction is intact, to spasm of the sphincter, and thus causing the fermenting material to lie an abnormally long time in the stomach. This leads later in part to mechanical distension, and in part, by means of the venous obstruction so closely connected with it, to injuries of the tissues of the mucosa and muscular coat, to their paresis and degeneration, and to muscular insufficiency. This is the reason why so-called "gluttons," diabetics, and lunatics with polyphagia so often suffer from dilatation of the stomach, and why it is developed in chronic catarrh, or, as is most usually the case, why it results from a combination of both causes. Naunyn * and his pupil Minkowski † have done more than any others to show these processes in their proper light.

---

[*] The ancients called conditions of this kind frigiditas stomachi. The expression atony was first used by Todd; Andral first introduced the term dyspepsie par asthénie de l'estomac, which was called dyspepsie asthénique by Broussais. The most various dyspeptic conditions were understood by these terms.

[†] Clozier. De la dilatation dite primitive de l'estomac. Bull. Med. 1888, p. 1245.

[‡] Miller. Einige gasbildende Pilze des Verdauungstractus, ihr Schicksal im Magen und ihre Reaction auf verschiedene Speisen. Deutsche med. Wochenschr. 1886, No. 8.

2. *Weakness and paralysis of the motor nerves of the stomach*, that is to say, a reduced impressionability of the peristaltic nervous apparatus, resulting either from local processes, for instance, ulcerative destruction of the gastric branches of the vagus nerve (Traube), or by inhibition from other parts of the nervous system, as, for instance, by the paralytic influence of a chronic peritoneal exudation (Bamberger), or even by simple stomach catarrh, in the same way as in cases of catarrh of the larynx we meet with paralysis of the muscles of the vocal cords.

We may perhaps class here the rare cases in which, contrary to the usual course of events, an atonic dilatation of the stomach is developed as a consequence of chronic and inveterate constipation, while as a rule exactly the contrary happens. We know that there is no clearly defined limit between the peristalsis of the intestines and that of the stomach, but that the peristalsis of the upper division of the bowel, as Braam-Houckgeest * has pointed out, may be started by contractions of the stomach. On the other hand a permanent sluggishness or paresis of the intestines might cause a diminution of the peristalsis of the stomach. G. Sée and Mathieu † have called attention to this fact. I have had occasion to observe an instructive instance of this kind in the case of a lady thirty years of age, who had suffered since her childhood from inveterate constipation (the complaint, as so often happens, was hereditary in her family), and who during the two years that I attended her, although she had never previously complained of disorders of the stomach, developed a typical gastrectasia, certainly without violent symptoms of decomposition, but at the same time acquired without any other cause.

---

* B. Naunyn. Ueber das Verhältniss der Magengährung zur mechan. Mageninsufficienz. D. Arch. f. klin. Med. Bd. xxxi. p. 225.

† Minkowski, l.c.

3. Finally, the expulsive powers may be weakened by *the disappearance of a more or less sharply defined region of the muscular coat* of the stomach. Circumscribed cancerous infiltrations and ulcers, which do not contract the stomach but destroy a part of its muscular coat, occasionally, if their growth be sufficiently slow, produce hypertrophic dilatation of the stomach. A similar condition is developed if broad strips of the muscular coat of the stomach are destroyed by ulcerative or inflammatory processes, with resulting partial dilatation situated behind the obstructed part, or total dilatation may result. Cruveilhier gives very instructive representations of these processes in his celebrated Atlas of Pathological Anatomy.

Gentlemen, so far as I know, we have given an exhaustive list of the causes of dilatation of the stomach. With your permission, we will now take a survey of ITS PATHOLOGICAL APPEARANCES.

We have already mentioned the rough anatomical changes and the great variety in size of the dilated stomach, and the displacement thereby occasioned of neighbouring organs—the intestines into the true pelvis, the liver, spleen, and diaphragm in an upward direction—as well as the nature and form of the new growths which may arise, and we shall be obliged to return to this subject when we discuss the symptoms of the disease. At present it is chiefly important for us to consider the condition of the separate layers of the wall of the stomach. It has long been known that the muscular coat as a whole, or in part, may be sometimes thickened, sometimes apparently normal, and sometimes thinned, and these differences have been classified as hypertrophic and atrophic forms. The hypertrophy of the muscular coat is met with chiefly in the pyloric region, and, as a rule, accompanies cases of cancerous or cicatricial stricture of the pylorus. It usually requires a careful examination with the microscope to decide whether the hypertrophy is genuine, or whether an apparent thickening of the muscular wall of the stomach has been caused by the deposit of cancerous elements. But occasionally the muscle of the pylorus is found to be hypertrophied without the existence of any manifest new growth or scar, and Lebert* asserts that he has found an increase in thickness in these muscular fibres amounting to fourteen mm.—it usually amounts to five to six mm., a very considerable size—which he believes to be the result of a chronic hypertrophic inflammation of the muscular coat, arising idiopathically and not from cancerous infiltration of the muscular wall. There is no doubt that the hypertrophic form may gradually pass into the atrophic. The former appears much more frequently in the case of young people, the latter, without exception, in old age, so that in the numerous cases of dilatation of the stomach in old people, where I have made an autopsy, I have never found hypertrophy of the muscular coat, but in the majority of cases it has been of normal thickness, or, more rarely, thinned. The individual muscular fibres present a normal appearance, and with picrocarmine a good nuclear staining is obtained. Since the year 1874 I have examined a number of dilated stomachs with the microscope, and have never discovered hypertrophy of individual muscle cells, such as Lebert mentions, or gelatinous degeneration of these cells (colloid degeneration) as described by Kussmaul and R. Meyer, and lately again found by Cahn, but in the generality of cases there was more or less fatty degeneration. The interstices between the bundles of muscular fibres seem to be widened and filled with connective tissue. In many cases there is a small-celled infiltration starting from the submucosa. This itself forms a wide-meshed tissue, infiltrated with numerous round cells and with greatly dilated vessels. The mucous membrane presents the features of chronic gastritis in its various stages. The glandular cells of the mucosa have in many places undergone no change, in others they are opaque and granular, and in others again they have undergone cystic degeneration, or have disappeared altogether in a small-celled infiltration which has also filled and pressed asunder the meshes of the interstitial tissue. Hypertrophy of the glands is nowhere to be found, neither do they appear to have increased in number. The interstitial tissue is considerably thickened and infiltrated with numerous round cells, the gland tubules present are scattered and separated by wide intervals, while, normally, they lie close together. (See fig. 11.) I have never discovered conditions which indicate the existence of either new formation or growth of glandular substance, that is, either hyperplasia or hypertrophy of the glands. While in the majority of cases the mucous membrane is stretched smoothly over the muscular coat, and is more inclined to thinning than to thickening, in the rarer forms of hypertrophic dilatation that condition is developed which is called by the French *état mamelonné*, caused by the unequal stretching of the mucosa and muscular coat, leading to a wrinkled elevation of the former.

---

* See part I., p. 167.

† G. Sée et Mathieu, De la dilatation atonique de l'estomac, Rev. de méd. 1884, 10 Mai, 10 Sept.; and A. Mathieu, Les phénomènes nervo-moteurs de la dyspepsie gastrique. Gaz. des hôpit. 1888, No. 47.

---

* Lebert, l.c. p. 525, et seq.

Dilatation of the stomach generally begins at the fundus, later on it extends to the whole stomach. The rare cases of diverticular dilatation caused by the continuous pressure of indigestible substances (pieces of money, &c.) in the stomach must be looked upon as pathological curiosities.

THE CLINICAL ASPECT OF DILATATION OF THE STOMACH.

Patients suffering from dilatation of the stomach are usually, as might be expected from the nature of the causes which produce this disease, middle-aged or somewhat older. But as my experience increases, I am astonished at the frequency with which this disease appears in youth without being recognised.

Pauli* states that stenosis of the pylorus may be congenital and cause dilatation, and Andral† says that children have been known to come into the world with stomachs that have filled the greater part of the abdominal cavity. Observations of a similar nature have frequently been made, and a short time ago we observed a marked dilatation of the stomach in the case of a girl of eighteen, who asserted that from her earliest childhood she had heard succussion sounds in her stomach, which at the time of the examination happened to be remarkably distinct. During the last year and a half I have, in the course of practice, met with

---

* Pauli. De ventriculi dilatatione. Frankfurt a. M. 1839.

† Andral. Grundriss der pathol. Anatomie. Herausg. von Becker, 1830, ii. p. 91.

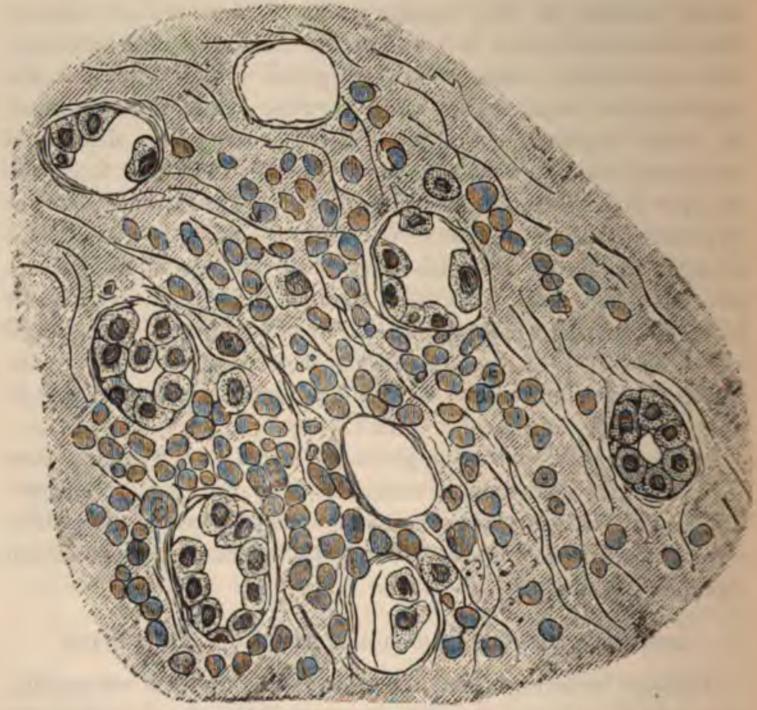


Fig. 11.—Transverse section through the mucous membrane of a dilated stomach. The gland tubules are separated and the intervals packed with a small-celled infiltration. The glandular epithelium is in parts unchanged, in others undergoing fatty degeneration, and in others, again, it has been completely desquamated. Some may be seen lying in the intervening tissue.—Camera lucida drawing.

five cases of gastrectasia in young people between fifteen and twenty-one years of age, all of which were considerable and some severe; one was a young peasant, one a schoolboy, and the other three were students. In one case only had the complaint been recognised, the others were treated as "chronic dyspepsia" or "nervous dyspepsia," and in no case could a tangible cause be discovered for the origin of the malady. Wiederhofer,* Comby,† Malibran,‡ and others who have proved the existence of dilatation of the stomach in children, have carefully studied the subject and have attributed it to atonic anæmic conditions.

Before entering on the symptomatology of dilatation, I must remark that cases sometimes occur which present the typical clinical aspect of dilatation of the stomach, such as I am about to describe to you, without the existence of dilatation proper. We will follow O. Rosenbach's§ example, and designate such cases as *insufficiency of the stomach*, or better, as *motor-insufficiency of the stomach*. I shall return to this subject in the discussion of their symptomatology. Symptoms of dilatation of the stomach are always developed slowly. As a rule they are preceded by dyspeptic complaints which may last for years, and which, under certain conditions, are the only symptoms of a fully developed dilatation. Hence the existence of the latter is only discovered by a very careful examination, as I experienced lately in the case of a young man, whose father, himself a physician, had provided him with an exhaustive statement in support of a diagnosis of nervous dyspepsia. To the usual dyspeptic difficulties—loss of appetite, weight and fulness after eating, tightness of the belly, a bad taste in the mouth, coated tongue, epigastric tenderness, restlessness, giddiness, headache, irregular action of the bowels, &c.—is added the characteristic symptom of vomiting. At first it is copious, and occurs at a comparatively short interval after food, and is to a certain extent a therapeutic effort on the part of the organism to get rid of the unmanageable quantity of ingesta, a portion of which remains in the stomach, like the urine in a paralysed bladder. Later on the vomiting becomes rarer, in proportion to the relaxation of the muscular wall, and to the increase of the material which requires to be ejected;

---

* Wiederhofer. Gerhardt's Handb. d. Kinderkrankheit. Bd. iv. Abtheil. 2, p. 356 et seq.

† Comby. De la dilatation de l'estomac chez les enfants. Arch. génér. de méd. 1884, Août et Sept.

‡ Malibran. Contribution à l'étude des ectasies gastriques. Thèse de Paris, 1885.

§ O. Rosenbach, l.c.

finally, and this is always *signum mali ominis*, it ceases entirely. Either the obstructing growth has ulcerated, and the passage into the bowel is again open, or a complete paralysis of the muscular wall has set in. The enormous amount of the vomit is characteristic, and in some cases is quite astonishing, having amounted to eight litres!! Portal states that the stomach of the Duc de Chausnes, one of the greatest gourmands in Paris, contained eight pints=4·5 litres of fluid, and still larger amounts are stated to have been found. It is known that occasionally the amount ejected is larger than that which has been taken, because remains of food which have long lain stagnant in the stomach are added. If the matter ejected, or brought up by means of the tube, be placed in a glass cylinder, it will soon separate into three layers, a brownish froth on the top, a far larger middle layer, formed of brownish yellow slightly turbid fluid, and a lower one, consisting of granular dark brown slimy masses, chiefly remains of food. From time to time bubbles rise to the top, sometimes bringing up small particles of sediment, while others sink down because they are no longer supported by the carbonic acid gas. Action of this kind, like the bubbles in a glass of champagne into which little bits of bread have been put, always indicates a considerable yeast fermentation. The ejected matter contains, besides this, the ingredients of the ingesta, in a more or less softened and digested condition; also mucor forms of sarcinæ, saccharomyces, and numerous schizomycetes. Du Barry,* at the instigation of Kussmaul, has subjected the above-named vegetable growths to a more accurate examination, and has isolated them in pure cultures, but, unfortunately, without attaining to any strictly pathognostic result. According to the investigations of this author, we are not justified in assuming that there is any fermentative action because of the presence and growth of *hyphomycetes*, but the schizomycetes, the saccharomycetes, and probably the sarcinæ, also, have a definite fermentative action. A somewhat extensive literature, which you will find arranged in order by Falkenheim,† has been written on the subject of the sarcina ventriculi, those curious colonies of cocci which accumulate in cubes or in tetrahedra, and which were first described by Goodsir in 1842. It is unfortunate that the pathognostic importance of this parasite does not entitle it to the attention which it has received from physicians. As early as the year 1849, Frerichs apologised for speaking on a subject "the literature of which is perhaps already greater than its importance merits," and Falkenheim has been able to contribute no new fact of either semiological or pathognostic nature, although he has proved the fact, important in the natural history of sarcinæ, that the same cocci may, under circumstances governed by external conditions, either form into irregular heaps, or into typical sarcinæ. As a rule, the sarcinæ are absent, or only present in small quantities, but under conditions favourable to their growth they sometimes appear in great quantities, so that every drop of the contents of the stomach is almost a pure culture; and F. Richter[*] has even published in Virchow's Archiv a case in which dense masses of sarcinæ led to complete closure of the pylorus.

---

* Du Barry. Beitrag zur Kenntniss der niederen Organismen im Mageninhalt. Arch. f. exp. Pathol. u. Pharmacol. Bd. xx. p. 243.

† Falkenheim. Ueber Sarcine. Arch. f. exp. Pathol. u. Pharmacol. Bd. xix.

Although, as I have just remarked, du Barry was not able, with some exceptions, to attribute definite processes of fermentation to the individual fungus elements isolated from the contents of the stomach, yet this by no means excludes them from a share in the collective fermentation, or proves their existence to be immaterial. I am far more inclined to agree with Minkowski[†] that their presence in large quantities always indicates a serious disturbance of the digestive processes, and therefore that they deserve to be looked for. The microscope reveals the existence and partly explains the nature of individual organisms if we examine the matter ejected or brought up through the tube, or if we filter it and examine the residue. Minkowski says, "If a microscopic examination proves the existence of large quantities of torulæ or bacteria in the contents of the stomach when the digestive process is at its height, or a long time after food, we may safely assume a morbid fermentation is occurring, but," he adds, immediately, "the words large quantities leave much room for differences of opinion." A certain quantity of microorganisms may be found in the contents of the healthiest stomach; these, however, are of no importance, because, as I said above, their further development is hindered by the action of the hydrochloric acid. This is proved by the fact that the filtered contents of the normal stomach may be exposed for weeks or months to the air without becoming turbid or mouldy, unless spores should happen to fall in. But if, even where free hydrochloric acid is present, organisms are abundant, or if the contents of the stomach should be neutral or rendered acid by organic acids, there will speedily be a growth of organisms in the filtered matter according to the nature of the prevailing fermentation. Either there will be a development—and this happens even when there is hydrochloric acid in the filtered matter—of hyphomycetes in the shape of white or grey mould on the surface, or after a preliminary cloudiness there will be a sediment of saccharomycetes, or there is a more continuous cloudiness, accompanied by a strongly acid smell from the development of lactic acid, acetic acid, and butyric acid bacteria, or, finally, there is on the surface a formation from zooglœa masses of white loose pellicles, leading finally to complete destruction of the albuminous bodies, the process being accompanied by a smell of putrefaction and the development of an alkaline reaction. In this way we can quickly recognise with comparative accuracy the prevailing organisms in the stomach contents of a given case, if we can be sure that they have not got into the filtered matter *post festum*, that is to say, from the air in the room. This possibility, except by the use of troublesome apparatus and preparations, can only be obviated by an immediate examination under the microscope to prove the existence of the fungi directly after the contents have been taken from the stomach. This is indispensable, and as under the most favourable conditions it takes twenty-four hours or more for the filtered matter to "germinate," the diagnostic value of the method just described, on the essential features of which Minkowski has laid so much stress, is much decreased, although its pathognostic interest remains.

---

[*] **Richter.** **Verstopfung d. Pylorus durch Sarcina ventriculi. Virchow's Arch. Bd. cvii. p. 198.**

[†] **Minkowski, l.c.**

The ejected matter sometimes contains remains of food, fruit stones, fish bones, &c., which the patient can be proved to have swallowed months previously. Werner* found in a dilated stomach 17 plum stones and 920 cherry stones, which must have lain there since the last cherry season, that is to say, fully nine months. But such things occasionally remain in the stomach when it is not dilated. Only the other day I found among the contents of the stomach, brought up from a patient suffering from neurasthenia, a small piece of fish skin which, according to his express statement, had lain there three days and a half.

---

* Werner. Zur Casuistik des Magenkrebses, &c. Württemburg. med. Correspondenzbl. 1869, 22—24. Might not the man in the meantime have eaten dried cherries, or cherry jam tart?

The chemical constitution of the gastric juice appears to undergo little alteration in quality in cases of dilatation of the stomach, unless this is due to cancer. In the latter case, all these anomalies of secretion are present which we shall discuss fully under the head of cancer of the stomach. But in cases of cicatricial stricture of the pylorus, atony of the muscular coat, hypersecretion, &c., we find the usual or even an increased quantity of hydrochloric acid, peptone, and propeptone present, almost without exception, while a sufficient, although retarded, peptic digestion may be observed. In thirty-three cases Riegel[*] found the hydrochloric acid vary from 0·1 to 0·46, while in twenty cases analysed by me, the acidity attributable to hydrochloric acid varied from 50—80=0·17—0·3 per cent. of hydrochloric acid. We shall understand the existence of hydrochloric acid if we remember that the gland tubules, so far as we can ascertain by the microscope, are for the most part unchanged, that the secretion of mucus which usually takes place in catarrh, and which is manifestly caused by the violent acidity of the stomach, is very small, and that there is no so-called mucous catarrh of the stomach. But these normal conditions of secretion are complicated by the fermentations which take place in the stomach, and which lead to secondary decompositions of its contents. In the first part of these lectures[†] I have given a general description of the carbohydrate fermentation, which, depending on the abnormal decomposition of sugar, soon takes the form of oxidising fermentations, in which alcohol, aldehyde, and acetic acid are formed from sugar, or lactic acid fermentation occurs, by which the sugar is split up first into lactic acid, and afterwards into butyric acid, carbonic acid, and hydrogen. Both processes of fermentation are connected with the existence of specific fermentative organisms, among which we may mention the *saccharomyces cerevisiæ*, the oidium lactis, and a number of schizomycetes, in the isolation and examination of which Hüppe has done distinguished service. Both processes may appear at the same time, and in rare cases may be combined with the products of cellulose fermentation; but it is a question whether the latter, that is to say, marsh gas, and, under certain conditions, olefiant gas, proceed from the stomach, or whether they do not rather originate in the intestine. The best known case of this kind is that described by Ruppstein* and myself, of a patient who, according to his own statement, "had sometimes a vinegar factory and at other times a gasworks inside him"; that is to say, the fermentation was sometimes associated with a preponderating formation of acid, while at others it was peculiarly favourable to the accumulation of gas. He could light the gas by ejecting it through a small paper tube or cigar-holder and applying a burning match before it, when a somewhat feeble flame was produced. Ruppstein found alcohol, acetic acid, lactic acid, and butyric acid in the ejected matter, while I discovered the gases to be composed of carbonic acid, hydrogen, marsh gas, traces of olefiant gas, oxygen, nitrogen, and sulphuretted hydrogen. Under ordinary conditions, however, we only have lactic acid, butyric acid, and acetic acid present, and in practice we may content ourselves with demonstrating the existence of the two first. It is a remarkable fact that the total acidity of the contents of the stomach is usually not above the average even in cases of serious decomposition, in spite of the pungent smell and the complaints made by the patient of the acid taste of the matter ejected or brought up; this is, no doubt, owing to the circumstance that the acids formed are rapidly converted into neutral or basic salts. For this reason, too, the transformation of starch into sugar undergoes little change. True sugars are rarely found, but as a rule erythrodextrine and great quantities of achroodextrine and maltose.

---

[*] Riegel. Beiträge zur Diagnostik und Therapie der Magenkrankheiten. Zeitsch. f. klin. Med. Bd. xi. Heft 2 u. 8.

[†] l.c., p. 70.

Another form of abnormal chemical transformation gives rise to the products of albuminous putrefaction, amidic acid and ammonia, which are characterised by their peculiar smell, while they may be recognised under the microscope by the preponderance of cocci, vibriones, and zooglœa masses, some of which move quickly over the field. In this case the reaction of the contents of the stomach is usually neutral, and may even become slightly alkaline if there should be a preponderance of the basic products of albuminous putrefaction. At any rate, the absence of hydrochloric acid, or its neutralisation by the products of disintegration already mentioned, gives rise to an ever-increasing decomposition, which may eventually combine with the above-mentioned fermentations and so produce great diversity in the symptoms. In such cases we often have to deal with large disintegrating new growths.

---

* A. Ewald. Ueber Magengährung und Bildung von Magengasen mit gelbbrennender Flamme. Reichert's and Du Bois' Archiv. 1874, p. 217.

Although the stagnation of the contents of the stomach exercises no noticeable influence on the secretion of the mucous membrane so long as its secretive elements retain their power, yet it exercises a most injurious influence on absorption. This goes hand in hand with paresis of the motor elements. The iodide of potassium test and the salol test show retardation of absorption and motion. The first may be retarded for half or a whole hour, the latter I have known to be delayed as long as two or three hours. But I do not wish you to understand that these reactions are always uniformly retarded in all cases of gastroectasy, or in the same case. You must realise fully that they throw light on a function and not on a disease, and that a seriously-dilated stomach may retain a normal, or almost normal, exercise of its functions in this respect. But if this is the case, the disturbances which are usually developed in other cases will be proportionally slight. Of fourteen cases of typical dilatation of the stomach in which I made use of the salol test I found five in which there was no serious retardation of the decomposition into salicylic acid. In three of these cases, too, the subjective symptoms nowise corresponded with dilatation of the stomach, a proof that the ingesta were promptly passed into the intestines, and by this means a compensation provided for the dilatation.

It is easy to see how these various functional derangements play into each other's hands. The formation of products of disintegration paralyses the muscular coat, and this paralysis favours stagnation, and at the same time the further decomposition of the ingesta. The deranged absorption not only retards the removal of the matter which is capable of absorption, but hinders the further formation of such matter.

The experiments of Schmidt-Mülheim, Cahn, and others, lead us to believe that the juices of the stomach lose their power of forming peptone as soon as a definite percentage of peptone has been formed, in the same way as the alcoholic fermentation ceases as soon as a certain quantity of alcohol has been formed. As peptone is neither absorbed nor passed into the intestines at the proper time, the nitrogenous food cannot be digested, and therefore in spite of the length of time that the ingesta remain in the stomach, quantities of wholly or partially undigested food are always present.

It is evident, on the other hand, that all these conditions may exist and manifest themselves without the existence of pronounced dilatation, but rather where there is motor insufficiency, or what was formerly called ataxy of the stomach. In such cases they are probably less intense, but they may be extreme, as is shown by the case quoted above of the patient with the gas-works inside him, who was found, contrary to our expectations, to be suffering from an almost concentric hypertrophy of the stomach and a constricting carcinoma of the pylorus; I must, however, add that these results were obtained by a method of examination which is defective when judged from our present standpoint.*

Such cases must, as I have already said, be described as motor insufficiency of the stomach, and will be dealt with in detail under the head of chronic inflammation of the mucous membrane of the stomach and under neuroses. These considerations, however, lead us to the conclusion that serious dilatation of the stomach may exist, the injurious effects of which are neutralised by sufficient compensation in the functions of absorption and motion. For this reason it is possible for a person to have an abnormally large stomach, which in the course of years will cause him little or no trouble, just as many people go for years with a highly developed valvular defect without being aware of their complaint, because the compensatory hypertrophy of the ventricle neutralises the defect of the valve. But sooner or later the compensation loses its efficacy and then all the symptoms of dilatation appear suddenly, or in a surprisingly short time. These are the cases so much noticed in English literature,[*] in which dilatation arises in an apparently acute form. Induced by the results of the salol experiment, I inflated the stomachs of two old people who were for years in the Incurable Hospital of this city, without complaining of any special affection of the stomach, and I was able to discover, in each case, well-developed dilatation of the stomach.

---

* A case anatomically similar is quoted by Diemerbroeck, 1685, and described by Penzoldt in his work on *Dilatation of the Stomach*, to prove that "a hard drinker" does not necessarily suffer from dilatation.

In the later stages of the disease the nutrition decreases steadily and severe marasmus sets in. While the vomiting becomes less frequent, the foul-smelling ructus and flatulence increase. The pressure of the dilated stomach causes displacement of the adjacent organs and derangement of their functions, particularly of the lungs, the heart, the liver, and the intestines. Dyspnœa and palpitation of the heart increase in proportion as the stomach, which is distended with ingesta and inflated with gas, presses up the diaphragm. Obstructions in the circulation of the liver with their natural results set in. The action of the bowels is languid, only kept up by enemata or violent drastic purges; the fæces are as a rule not pulpy, but are hard masses mixed with water and mucus. A rare but very remarkable symptom, if present, is the one first described by Kussmaul, which we have already mentioned, viz., peristaltic agitation of the stomach. Large waves are observed to proceed slowly across the stomach obliquely downward from right to left; they may also affect the lower divisions of the bowel, and in rare cases even take an anti-peristaltic course (Cahn). It is evident that there must be well-marked obstruction at the pylorus with relative soundness of the muscular and nervous apparatus for their production.

Absorption by the stomach is not only deficient or suspended, but it is diminished in the bowel too, which is rarely and insufficiently supplied with chyme from the stomach. This applies especially to the absorption of water, so that there results an abnormal dryness of the muscular and nervous tissues and of the skin, which becomes scaly, almost as it does in the last stages of diabetes, with sometimes a good deal of pityriasis. To this desiccation Kussmaul[†] attributes a nervous symptom observed by him, which takes the form of painful spasm in the flexor muscles of the arms, the calves of the legs, and the abdominal muscles, which under certain conditions is combined with a kind of nystagmus, mydriasis, emprosthotonos, as well as with disturbances of consciousness, and a condition very similar to, if not identical with, the tetany which arises after acute infectious disorders, rheumatism, serious cases of exhaustion, &c. This spasm begins with pains in the stomach and other parts of the body, and with feelings of oppression, and may occasionally last for several hours. Kussmaul is inclined to attribute it, as in cholera, to a sudden decrease of water in the already dried-up patient, which is caused by vomiting or by washing out the stomach. But similar symptoms are observed in other diseases, for instance, in convalescence from typhoid fever, especially where relapses occur, but in this case there is no possibility of tracing them to any such cause. Gerhardt * points out that in a case observed by him, the spasm made its appearance in the upper extremities, and not in the lower, as in cases of cholera,† and he traces it to the absorption of the products of decomposition contained in the substances stagnating in the stomach. But if this were the case, it could not appear where the treatment was rational, yet it occurred in the cases mentioned by Kussmaul.

---

[*] *E.g.*, Hilton Fagge. On acute dilatation of the stomach, Guy's Hosp. rep. xviii. 1—22; and Allbutt, On Gastroectasia, Lancet, 1887.

[†] Kussmaul. Ueber die Behandlung der Magenerweiterung, &c. D. Arch. f. kl. Med. Bd. vi. p. 455; also Laprevotte, Des accidents tétaniformes dans la dilatation de l'estomac, Paris, 1884.

While, as appears from this, the deranged absorption of water, and the dryness of the tissues resulting therefrom, may in isolated cases lead to an abnormal irritability of the nervous system, which may increase till it becomes a pronounced form of tetany, in other cases the absorption of the products of decomposition into the blood will result in an auto-intoxication taking the form of nervous depression, which has been called not unfitly "coma dyspepticum." Two characteristic cases of the first kind, which, together with the symptoms already mentioned, showed a perceptible increase in the mechanical and electric irritability of the nerves and muscles, have been described by Fr. Müller.‡

---

* Gerhardt in Zabludowski. Zur Massagetherapie. Berliner klin. Wochenschr. 1887, p. 443.

† Dujardin-Beaumetz, and Beltinger made the same observation, Note sur un cas de dilatation de l'estomac continuée de tétanie généralisée. L'Union méd. 1884, No. 15 u. 18.

‡ Fr. Müller. Tetanie bei Dilatatio ventriculi und Achsendrehung des Magens. Charité-Annalen, 1888, Bd. xiii. p. 273.

Minkowski[*] has noted the occurrence of severe coma in the course of dilatation of the stomach, causing the death of the patient at the end of two days; while Litten has observed similar, but less intense conditions, in cases of acute dyspepsia, where he has also observed the ethyl-diacetic acid reaction in the urine.[†] This appears to point to the formation and absorption of substances, which under normal conditions are not present in the gastro-intestinal canal, or at least are not capable of absorption; yet Fr. Müller has not succeeded in isolating from the contents of the stomach of his cases of tetany any poisonous alkaloid or toxin, perhaps because, as he himself points out, the substance examined, although it had an unpleasantly acid smell, was not thoroughly putrid, and no further decomposition had taken place. It is therefore possible that the tetany represents a reflex process proceeding from the stomach, in favour of which supposition many analogies collected by Müller may be found, but we may content ourselves with mentioning the well-known convulsions caused by worms. In any case tetany is a serious complication of dilatation of the stomach, for out of eight cases collected by the above-named authors five terminated fatally, which would show a mortality of 62·5 per cent.

As long as the disease takes an undisturbed course, the urine shows no special and characteristic peculiarity. Although I have examined many cases with this object in view, I have never had occasion to observe the peptonuria mentioned by G. Sée, and noted by Bouchard in seven per cent. of his cases. The quantity of the urine in the later stages of the disease is sometimes, but not generally, diminished. Perhaps this, as well as the alkalinity of the urine,[‡] may be traced to washing out the stomach, which was regularly performed during the treatment. Quincke considers the defective absorption of the acids of the stomach by its wall to be the cause, because by this means an essential factor in the acidulation of the urine is done away with. This is very probable as long as the alteration of the chemical processes which are combined with dilatation is not removed. But, in my opinion, on the contrary, the more care one bestows on the improvement of the condition of the organ by means of regular washing, the more favourable must the conditions of absorption become, and washing would therefore cause acidity rather than alkalinity of the urine. This view is supported by an observation made by Winkhaus,* which shows that in a case of marked dilatation of the stomach, the urine collected several times during the day, gave an alkaline reaction so long as the fermentations in the stomach were left to take their course, but became acid a short interval after each washing. It depends, however, entirely on the ultimate cause of the dilatation whether any considerable quantity of gastric hydrochloric acid can be excreted.

---

[*] Minkowski, l.c., p. 163.

[†] M. Litten. Eigenartiger Symptomencomplex im Folge von Selbstinfection bei dyspeptischen Zuständen. Zeitschr. f. klin. Med. Bd. 7, Supplementheft. p. 81 et seq.

[‡] Quincke. Dilatatio ventriculi mit Durchbruck in das Colon. Eigenthümliches Verhalten des Urins. Correspondenzbl. für Schweizer Aerzte, 1874, No. 1.

Gentlemen, were I now to follow the usual plan, and speak to you of the *diagnosis of dilatation of the stomach*, I should merely repeat myself, for everything which concerns diagnosis has been already fully discussed, and in cases of dilatation of the stomach the so-called differential diagnosis takes a less prominent position than in others. As a matter of course it is necessary to avoid mistaking for it a distended colon, ovarian cysts, encysted ascites, hydronephrosis, and hydatid tumours, but by careful examination, made according to the methods above described, such a danger need hardly be taken into serious consideration. Except in the cases already mentioned, where dilatation appears in young people, doctors are inclined to diagnose dilatation of the stomach too often rather than too seldom. It would be, however, of the utmost importance if we could distinguish clearly between insufficiency of the stomach and gastroectasy proper. This may easily be done when it is merely a question of the symptoms of dilatation without the stomach itself being really dilated—under such conditions the only difficulty will be to exclude a primary catarrhal affection—it is, however, impossible, and the diagnosis can only be made *ex juvantibus*, if during the earlier stages of the complaint, when the symptoms are little pronounced, there should be at the same time a natural enlargement, giving rise to the deceptive appearance of the earlier stages of gastroectasy. In the more advanced stages there is no possibility of doubt.

---

* H. Winkhaus. Beitrag zur Lehre von der Magenerweiterung. Inaug.-Diss. Marburg, 1887.

COURSE AND PROGNOSIS.

Both of these are connected most intimately with the original cause of the dilatation. If the latter should result from a malignant tumour the duration of the disorder will depend upon the course of the cancerous disease, and the prognosis must be always unfavourable; but we must recollect that during the course of such complaints remissions may occur under rational treatment which may cause the patient to feel comparatively well for weeks or even months. This may account for a good many of the cases which figure in literature as "cured." I, at least, have never known a gastroectasy of this kind to be cured, but I have repeatedly seen cases in which temporary improvement threw doubts on the correctness of the diagnosis till its accuracy was proved by a *post-mortem* examination.

If the dilatation be caused by constricting cicatrices, or by enfeeblement of the muscular coat, the course of the disease will be slower, and the prognosis on the whole more favourable. But unfortunately here, too, "*Prævalebunt fata consiliis!*" Such patients carry their dilated stomachs about with them for years, and with proper diet and treatment may lead a tolerable and almost painless existence, if they will only bear in mind that every step from the right path, that is to say, every imprudence in diet, which need not be excessive but only a slight deviation from the prescribed rule, will cause not a momentary feeling of discomfort but serious derangement, which it is sometimes impossible to correct. It is the special characteristic of all dyspeptic conditions of a serious and chronic nature that they should not only be subject to relapses, but that these relapses should be more persistent and difficult to cure than the original attack. But I must lay special stress on the fact that dilatations of this kind when they are once recognised, after having been, as is often the case, treated with all manner of useless "stomach remedies," offer a very fine field for the exercise of treatment. We can almost certainly promise to patients of this kind a considerable improvement in their condition, or even, if we consider only the subjective complaints, a cure of their disease. But respecting the latter, the future would undeceive them. As far as my experience goes, these dilatations are incurable, and in the end the prognosis is always unfavourable; at least in four cases which I had the opportunity of observing for years—from six to eight years—in spite of subjective improvement, and even apparent cure, the stomach when inflated was always found to be as large as ever, and the same result has been found in the many *post-mortem* examinations of such cases which I have lately had repeated opportunities of seeing.

The stomach, when it is once dilated, cannot be drawn together again like a tobacco pouch, any more than, with the exception of the isolated cases of acute dilatation of the heart, an excentrically hypertrophied heart can return to its normal dimensions. If the muscular and glandular structures are once separated and infiltrated with a richly developed interstitial tissue, if fatty or other degeneration of the muscular fibres occurs, if the gland tubules are partially atrophied or undergo cystic degeneration, in short, if atonic atrophy of the walls of the stomach has set in, there is no longer any possibility of cure. Therapeutic and dietetic remedies gradually lose their efficacy, and the patient sinks slowly, with increasing marasmus and more or less pronounced dropsical effusions.

A decided improvement and even cure of gastrectasia can only be expected when the disease is in an early stage, and is due to functional derangements, atony, defective innervation, or catarrhal conditions of the mucous membrane, or when the obstruction to the emptying of the stomach can be removed by an operation, as in the case recorded by Klemperer which we have already quoted. In these cases the relaxed muscles may recover their tone, and the mucous membrane regain its normal conditions and functions, the interstitial infiltration may be absorbed, and the organ *in toto* brought back to its former size. It is evident that all this, in exact analogy with the relations which govern the condition of other organs, is only possible so long as the anatomical change has not gone beyond a definite and even slight amount.

The cases of dilatation of the stomach which proceed from a chlorotic or anæmic cause, and which are described as cured, are not cases of gastrectasia at all, according to the definition given above, but come under the heading of insufficiency of the stomach, which is at times combined with megastria.

The treatment of dilatation of the stomach has two objects in view:

1. By a carefully chosen diet and appropriate medication to facilitate and promote the gastric digestion so far as possible, and at times to supply the organism with nourishment in other ways;

2. To prevent the stagnation of the contents of the stomach, to cause them to pass in either an upward or downward direction, and to check the fermentative processes which are developed in the stomach.

In cases of dilatation of the stomach the food taken should have the smallest possible bulk. The use of fluids should be restricted as far as possible, and thin soups, large quantities of alcoholic drinks, mineral or pure waters, tea or coffee in any quantity, should be entirely avoided. I allow only a small quantity of milk, from a tea to a tablespoonful, taken at short intervals. If it were possible to carry it out, the best treatment under such circumstances would be Schroth's dry diet system. But as it is never a question of a short time, but of months and perhaps of years, this is not possible, and we must content ourselves with a modified dry diet. It is remarkable that Germain Sée does not consider it necessary to deprive the patient of fluids because these are most easily and quickly absorbed. This is a fatal mistake, for the absorption of fluids is also retarded; they remain in the stomach, and not only promote the processes of fermentation, but by their weight exercise a purely mechanical influence in dilating the organ. Among the preparations of peptone I should recommend the use of Koch's or Kemmerich's meat peptone, the meat-peptone-chocolate, Maggi's peptone-pastilles, meat-juice, &c., all of which contain much nourishment in a small compass. I have lately proved the value of condensed peptonised milk, which is offered for sale in small packets as the so-called "Mother's Milk Samples," or in larger boxes; it has the consistence of gelatine, and is pleasant to the taste. Meat powder too, which can be prepared at home from dried and pulverised meat, is, when properly flavoured, readily taken as a sort of meat gruel. It is evident that all food which has a tendency to ferment, first and foremost starchy matter, and fruit and vegetables containing any great quantity of sugar, must be entirely avoided, and it is only by a concession to the natural craving for starchy food that we allow the patient to take small quantities of bread, about 75 to 100 grammes daily, that is to say, two or three rolls of white bread. The decomposition of fat takes place slowly, as is proved by the fact that when the stomach is washed out, six or seven hours after food has been taken, the fat is found floating in droplets of different sizes on the top of the water, without, however, any strong smell of fatty acids being perceptible, as is always the case when regular washing is neglected. But as fat itself appears to have an irritative action on the mucous membrane, it should be as far as possible avoided. The strength of the patient should be kept up with small quantities of strong wine and unsweetened tea or coffee. Nutrient enemata, in the form suggested by me or as peptone suppositories, may be used for weeks and months together, and are an essential aid to the supply of nourishment. With their assistance, the nourishment *per os* may be reduced to a minimum for some days, that is to say, until the digestive condition of the stomach has improved so far as possible, and with the use of these enemata one has the further advantage that the fluid passed through them checks the drain of water from the tissues (Liebermeister).

Hydrochloric acid in large doses is an excellent remedy in all cases of gastrectasia which do not proceed from pure atony of the muscular coat. To begin with, from ten to fifteen drops of the acidum muriatic. dilut. should be taken every hour in a tablespoonful of water, through a glass tube. I should recommend, too, salicylic acid, either pure or in the shape of salicylate of bismuth, in doses of 0·3—0·5 grm., or benzoin. Minkowski recommends large doses of carbolic acid, 0·1! and more, to be taken in the shape of pills before meals. I can testify to the good effects of creosote taken in doses of 0·1—0·2 several times a day, a remedy used by Mannkopff in gastric fermentations as early as 1861. If there should be carcinoma of the stomach it will be best to use an infusion of condurango with the above quantity of hydrochloric acid. When there is violent pain in the stomach I make use of the sedative and antiseptic action of chloroform from 3—5 drops in a teaspoonful of water or of chloral in combination with cocaine: ℞ cocain. muriat. 0·3, hydrat. chloral. 3·0, aq. menth. pip. 50·0, aq. 100. Dujardin-Beaumetz recommends the injection of large doses of bismuth (50 : 500), which is said to cause a deposit of bismuth on the mucous membrane of the stomach;* injections of morphia, too, are sometimes indispensable. Atony of the muscular coat necessitates the use of strychnine, either as extract or tincture, which Skjelderup and Duplay* have already recommended without giving this exact indication for their use. The extract can be given in large doses of 0·1—0·15! per day without causing any injurious secondary results. Dr. Wolff has proved to me that it increases the production of hydrochloric acid. Cathartics and drastic purgatives have always played a leading part in the treatment of gastrectasia, and if they can pass the pylorus or be absorbed at all, which is unfortunately not always the case, they are most useful, not only for the evacuation of the intestines, but by a sympathetic stimulus which they exercise on the peristaltic action of the stomach for the evacuation of that organ also. Penzoldt has been able to calculate exactly the good effects of the use of Carlsbad salt in removing the contents of the stomach, as under otherwise similar conditions he brought up contents amounting to 850 cc. when the salt was taken, and 1,525 cc. when it was not. Kussmaul recommends drastic pills of extr. colocynth. spirit. 0·5, extr. rhei compos. or extr. aloës aquos. and scammonium ana 2·0, pill. xxx (to be taken before the midday meal). I have frequently made use of subcutaneous injections of aloine with good results. In order to carry out the second indication of treatment given above, we must employ the stomach tube, which is the sovereign remedy in cases of dilatation. I pass over the various apparatus which have been invented for this purpose, because in my opinion they are all more plague than profit. The simplest and most effective plan is to make use of a stomach tube with a funnel attached to it, and to cleanse the stomach by the alternate introduction and withdrawal of large quantities of water, a proceeding which must be continued till the water is brought up clear, or at least only slightly turbid, and perfectly free from any remains of food and flakes of mucus. Occasionally, towards the end of the operation, the water will become quite clear, and then suddenly becomes turbid again and brings up large quantities of the contents of the stomach, which fact is accounted for by the existence of separate recesses in the stomach, the contents of which are at last stirred up by the force of the injected water or by the pressure exerted by the patient upon the bowels and a reflux of her contents in the stomach.

---

* Bullet. gén. de thérapeutique, 1883, No. 1.

---

* Arch. gén. de méd. 1883, Nov., Dec.

Time must be given for the processes of gastric digestion, and on this account the stomach must only be emptied when there is a large accumulation of ingesta, that is to say, six or seven hours after the principal meal. To the washing proper, which is an important opponent to the mechanical overloading of the stomach, we must add the irrigation of the mucous membrane with antiseptic or antifermentative solutions. When the fermentation is extreme it will be well to follow the advice of Naunyn and Minkowski to perform the operation in the morning on an empty stomach, as the coat of the stomach will be more thoroughly and quickly cleaned, and the exciters of fermentation will be better washed out of the folds of the mucous membrane. I have treated cases in which the washing was accompanied with far better results when undertaken in the morning than in the evening. For antiseptic purposes I should recommend the use of solutions of salicylic acid 3 to 5 per mille, or borax 2 to 4 per cent. (dissolved in hot water), or hyposulphite of soda 10 to 20 per cent., as well as a great number of other disinfectants, naphthaline, resorcin, benzoic acid, permanganate of potassium, chloroform-water, &c. The first-mentioned however, the good effects of which have been proved, ought to suffice.

The advantages resulting from this method are evident, and the only wonder is that it was not made use of earlier. To avoid repetition, I pass over the results effected in the cases of washing out the stomach which we have already discussed, and from which you may easily perceive the manifold good effects of the method. I must only mention one advantage which results frequently, though not regularly, that is, the favourable influence on the bowels. Many patients who during the whole course of the complaint are troubled by habitual constipation have copious motions after the washing, especially when the operation is first performed, and they feel benefited by the treatment in this way also. Kussmaul,* who has already laid stress on this result of washing out the stomach, considers it a bad sign when it fails to appear, and the constipation continues to be inveterate. In his opinion it indicates a disorganisation of the stomach which cannot be made good again, and incurable stricture of the pylorus. *But this much is certain, that in no other branch of the entire treatment of gastric diseases may such brilliant results be*

---

* l.c. p. 467.

obtained as in the treatment of protracted dilatation of the stomach. The disgusting vomiting, the feeling of oppression, eructation, dyspeptic difficulties, and cerebral symptoms all disappear, or are much diminished. Unfortunately, as I have already said, in cases of dilatation proper these are only palliative results.

How often should the stomach be washed out? Daily, or at longer intervals, or more than once during the day? I consider daily washings at a given time to be indispensable, but at the same time sufficient. But they must be regularly carried on for a sufficient time—the patient will soon learn to do it for himself—without relying merely on the patient's subjective feelings. Should long pauses be made in consequence of apparent improvement in the condition of the patient, they will always be followed by relapses, due to stagnation in the stomach with its natural consequences. Our modern methods of procedure are so simple and so safe that less objection can be urged against them than, for instance, against the constant use of the catheter in cases of prostatic enlargement. I have never experienced any bad results from washing out the stomach, but one case is mentioned by Martin,* in which the patient, who was suffering from a dilated stomach in consequence of stricture of the pylorus, died suddenly six hours after the tube had been introduced, and the stomach washed out. The *post-mortem* examination showed that the stomach was uninjured, and as sudden collapse and death sometimes occur in cases of cancer without any discoverable cause, I do not consider it proved that in this case a *propter hoc* occurred. I regard *massage* and *faradisation of the stomach* as useful adjuncts to the use of the tube. Massage when skilfully carried out presses the contents of the stomach into the intestines, and thus widens the pylorus by mechanical pressure. But care must be taken to avoid bringing substances into the duodenum which are too acid and pungent to be sufficiently neutralised by the intestinal juices, and which may give rise to irritation of the mucous membrane of the bowel. Zabludowski† gives an account of massage carried out with very successful results in Gerhardt's wards in cases of dilatation of the stomach, and adds a minute description of the technical methods employed.

It was formerly difficult to tell whether faradisation of the abdominal walls had an effect on the muscles of the stomach, or whether this was not limited to the muscles of the wall of the abdomen. Pepper, in a case of dilatation caused by cancer of the pylorus, in which the peristaltic action was plainly visible, failed to stimulate the wall of the stomach by means of faradisation or galvanism.* But the experiments with salol made by Dr. Sievers and myself, and by Einhorn, have proved that the passage of the gastric contents into the intestines is much accelerated by energetic external faradisation of the region of the stomach, and Brunner † has supported this by convincing himself that the test-breakfast disappeared from the stomach much more quickly when the abdominal walls were vigorously faradised, while with him the salol method failed. Success would be more certain if the electrodes were applied *in loco*, the one passed into the stomach, the other either placed on the abdominal walls or applied as a rectal electrode, so that by this means the current would affect the whole digestive tract, and a very powerful action be secured. Cold douches and applications, as well as the so-called Scottish douche recommended by Winternitz and Baum,‡ are said to act as tonics to the muscles of the stomach.

---

* Martin. Death after washing out dilated stomach. Lancet, 1887, No. 2.

† Zabludowski. Zur Massagetherapie. Berl. klin. Wochenschrift, 1886, p. 443.

In conclusion, we must mention the opening up of stenoses by means of operations. I can only touch upon this subject, which is out of my province, and call your attention to the fact that in the last few years a number of successful operations have been performed, both by removing constricting new growths, and by forcible dilatation of cicatricial strictures. Hubert describes two cases of forcible digital dilatation of cicatricial stricture of the pylorus, performed by Professor Loreta, of Bologna, which are said to have completely cured the disease.§ Specially worthy of attention is the method proposed by Heinecke and Mikulicz of splitting the stricture lengthways and sewing it up crossways, which has lately been done several times with good effect. But the physician must leave this province to the surgeon, and confine himself to providing suitable cases and making his diagnosis and prognosis as exact as possible. From all that I have lately had occasion to observe here, I consider myself justified in prophesying a glorious future for the operative surgery of the stomach, and the time is perhaps not far distant when a lanceolate or leaf-shaped piece will be excised from a dilated stomach, in the same way as prolapse of the vaginal mucous membrane and uterus is treated, by means of a wedge-shaped excision. Our ideas and expectations have indeed changed since the time when Kussmaul, as lately as the year 1869, feared to be "openly or secretly laughed at" for the mere mention of such a possibility![*]

---

* Pepper. A case of scirrhus of the pylorus, &c. Phil. Med. Times, May, 1871.

† W. Brunner. Zur Diagnostik der motorischen Insufficienz des Magens. Deutsche med. Wochenschr. 1889, No. 7.

‡ Wiener med. Presse, 1873, No. 17.

§ Hubert. Deux cas, &c. Journ. de méd. de Bruxelles, Avril, 1883, pp. 309, 318.

With your permission I will now place before you some practical examples of the subject which we have discussed, and for this purpose I have intentionally avoided hospital cases, and have chosen patients such as we see daily in the consulting room.

You see here the secretary to a railway company, a man fifty-two years of age, the past history of whose complaint I will give you in his own words.

"Ten months ago, in the early part of last year, I fell ill with loss of appetite, constipation, slight feelings of discomfort, and cough accompanied by expectoration. On the recommendation of my doctor, I went on the 14th of June last year to Görbersdorf, in Silesia, and from that time till the 10th of July underwent a course of treatment in Dr. Römpler's establishment. On the 10th of July I went to Carlsbad, where dilatation of the stomach was discovered to exist. I was treated there till the 14th of August (5 weeks), and the doctor told me that I had come to the right place. In Carlsbad I drank the Schlossbrunnen, three half-glasses a day, and took besides four shower baths and eight mud baths (one every third day). The baths had always a soothing effect, which lasted for some hours. I felt much weakened by the course of treatment in Carlsbad, from which I did not recover quickly, and a slow process of improvement could only be marked at intervals of four or five weeks. After the 10th of August I put myself into the hands of another doctor."

When on the 24th October I for the first time examined this gentleman, who had been sent to me by his family doctor, he was thin, but did not look at all ill. The heart and lungs are healthy, the liver not enlarged, and its lower border is distinctly to be felt a finger's breadth below the costal arch. The spleen is not enlarged, but the following changes have taken place in the stomach: by merely looking at the abdominal region, especially when the patient lies on his back against the light, a slight protuberance about the size of a five-shilling piece may be observed in the region of the umbilicus, and extending to the right of that region, which, however, protrudes so slightly that it is only visible by means of the relief afforded by its own shadow. With this exception the abdominal walls are smooth, neither sunk in like a trough nor abnormally protuberant. Palpation proves the existence of a hard, knobby, easily moved tumour, the size of an apple, which does not, however, descend with respiration, and is perfectly insensitive to pressure. Tapotement elicits loud succussion sounds. No crackling sounds. The lymphatic glands are as large as peas in the inguinal folds, but not swollen in any other place. The patient has taken a test breakfast. We pass the tube into his stomach and bring up about a hundred cc. of thin fluid, containing some remains of roll. We now inflate the stomach with the spray apparatus, and you see, gentlemen, how the tumour slightly shifts its position and descends on the right side, and how clearly the contours of the stomach are defined. Merely by looking, and still more clearly by means of percussion, we can trace the limits of the greater curvature three cm. below the umbilicus. The examination of the contents of the stomach, which have been filtered in the meantime, shows the complete absence of hydrochloric acid, a slight peptone reaction, large quantities of propeptone, erythrodextrin, and fatty acids, but no lactic acid. I must remark that the results of a previous examination showed defective albuminous digestion in the filtered contents of the stomach, and an examination made six hours after a dinner consisting of meat, potatoes, bread, and soup, gave the same results. There are no cancerous elements, saccharomyces, or sarcinæ to be found. The patient took one grm. of salol yesterday, and has brought with him the urine evacuated three-quarters of an hour, one hour and a quarter, and one hour and three-quarters after. You see that the addition of perchloride of iron solution to the last portion produces an indistinct violet staining, but that it is necessary to mix ether with the urine in order to obtain a definite though slight reaction.

---

[*] l.c. p. 485.

Gentlemen, we can after this have no hesitation in diagnosing *a cancerous stenosis of the pylorus with consecutive dilatation of the stomach.* It is an interesting feature of this case that the beginning of the complaint was so gradual, and there was so little to point to the stomach as the seat of the disorder, that it was possible, on account of a bronchial catarrh from which the patient was then suffering, to attribute his sufferings to phthisis, and to send him in consequence to Görbersdorf. I have seen the most beneficial results from the treatment of phthisis at Görbersdorf, but carcinoma cannot be cured there! The case is so far favourable, as on the one hand the strength of the patient is comparatively little exhausted, and on the other there is comparatively little tendency to decomposition in the contents of the stomach. With regard to treatment, the patient has taken condurango and hydrochloric acid, and for a week his stomach has been regularly washed out every other day, six hours after the midday meal, which washing has always brought up considerable quantities of brown-coloured contents of the stomach. I have suggested the excision of the tumour to the patient, which competent persons assure me might well be done, but he feels so much better in consequence of the present course of treatment that he cannot make up his mind to an operation, and thus, as unfortunately so often happens, the most favourable opportunity for its performance will be allowed to slip by.

The second case, which I will treat less in detail, is that of this lady, who is fifty-two years of age, tall, well-built, and somewhat pale. She has suffered for about a year and a half from acid eructations, which are so violent that she feels as if her throat contained "an acid canal." In addition to this she suffers from increasing loss of appetite, and partly from this cause, partly because she has been very strictly dieted, her nutrition has suffered considerably. There is no dysphagia. Vomiting occurs seldom, lately about once a fortnight, and the matter brought up is said to be mucous and highly acid, mixed with remains of food which have undergone little change, but never contain blood. The action of the bowels is languid and difficult. The urine has been repeatedly examined and found to be normal. The woman was formerly in good health, attended to her household affairs, and has had nine children. I will pass over the examination of the other organs, which are normal, and call your attention to the abdominal walls, which are relaxed and markedly protuberant, and in which a loud succussion sound may be readily produced. A tumour can nowhere be felt, but the pulsation of the aorta is perceptible. The lady expresses through the tube a light brown fluid; four hours ago she took some meat and coffee, and distension with air shows that the whole abdominal cavity is at once inflated, so that the course of the lower contour of the stomach may be traced close above the symphysis, and the whole abdominal cavity looks like a blown-up balloon. The salol test shows no retardation. The filtered contents of the stomach have an acidity of 48 per cent. with standard soda solution, give unmistakable signs of containing free hydrochloric acid and peptone, with only traces of propeptone, and digest well. Lactic acid is present in small quantities.

The diagnosis of dilatation of the stomach, which is undoubtedly correct, does not seem to have been made so far. The question is, to what cause can the dilatation be traced? The idea of an ulcer may in all probability be rejected, on account of the absence of pain, and more especially on account of the good health which the patient has previously enjoyed. For the same reason the idea of any kind of tumour is excluded, and provided that a continued course of observation gives the same results as those obtained to-day, the malady can only be ascribed to a cicatricial deformity, or to an essential atony of the muscular wall of the stomach. Although the former might be caused by a latent progressive peritonitis following parturition, we cannot do more than make a guess on the subject. At any rate, the existence of free hydrochloric acid, &c., entitles us to anticipate a speedy improvement in the condition of the patient. She comes from a distance, and I have recommended her to enter the sanatorium, where I shall treat her with appropriate dry diet, regular washing, doses of strychnine, and faradisation of the stomach, and I hope to show her to you again at the end of our course of lectures.*

---

* In order to show what mistakes may be made in a diagnosis, made after one examination, however carefully conducted, I must tell you that as we watched the patient for about three weeks the quantity of hydrochloric acid permanently disappeared, and when she was in a certain position, and the stomach was filled to a certain extent, a small tumour, hardly as large as a walnut, could sometimes be felt in the pyloric region. I have purposely left my previous description of the case unaltered. The patient, as I was informed, died a few months after of "cancer of the stomach."

The third patient whom I wish to show you is a student, twenty-one years of age, a strong healthy-looking young man. For a year and a quarter he has complained of distension, feelings of fulness and oppression, capricious appetite, irregular action of the bowels, and these symptoms, when present, have been accompanied by loss of sleep, headache, attacks of giddiness, which soon passed off, and anxiety. For these reasons he diets himself very strictly, avoids all students' beer-drinking parties, and has a hypochondriac tendency. The tongue is clean, he has never suffered from eructation or vomiting; expression by the tube shows the gastric contents to possess a normal chemical constitution, the stomach is normal in size, and one would be inclined to class this case under the heading of nervous dyspepsia, if the iodide of potassium and salol tests did not combine to show a retardation of absorption and motion. I have, therefore, no hesitation in describing this case as one of insufficiency of the stomach, and the good effects of the treatment to which the patient has been subjected seem to prove the correctness of the diagnosis. For a fortnight he has taken 0·03 extr. strychninæ three times a day, and is faradised every other day. The attacks have ceased since this course of treatment has been entered upon.

I believe, gentlemen, that in these three cases I have brought the various types of dilatation under your notice. You will see from them that the mere diagnosis of dilatation of the stomach is not sufficient, but that prognosis and treatment are greatly influenced by our knowledge of the causes which lie at the root of the complaint.

LECTURE V.

CANCER OF THE STOMACH.

GENTLEMEN,—Although it is to a certain extent important to ascertain from the statistics which are published every year, and of which we possess a great number, that about 0·5 to 2·5 per cent. of the total death rate is ascribed to cancer of the stomach, and that between 35 and 45 per cent. of all cases of cancer are situated in the stomach; yet these statistics are more interesting from a general nosological point of view than important for the physician in any concrete case. It is far more important to ascertain the age at which cancer of the stomach generally occurs. The statistics given by various authors, among whom Brinton with his 600 cases, and Welch with 2,075 cases, take the first place, are fairly unanimous, and show that 75 per cent. of all cases of cancer of the stomach occur between the 40th and 70th years; the maximum lies between the 50th and 60th, or, according to Lebert, between the 41st and 60th years. Cancer of the stomach very rarely appears before the 30th year; it seems never to be congenital, and a case described by Wilkinson* must be looked upon as a very great exception. Taken in the order of the decades, the following results are obtained:—

	10—20	20—30	30—40	40—50	50—60	60—70	70—80	80—90
Welch	2	55	271	499	620	428	140	
Brinton	¼	11	31	63	88	100	52	60
Lebert†	3		55	96	95	61	13	1

so that the frequency during the four decades from the 31st to the end of the 70th year is 94·6 per cent. But these statistics, as I have already said, refer only to the relative mortality of particular ages as compared with the total mortality from cancer of the stomach. Were we to reckon the number of cases of cancer of the stomach as compared with the population in each decade, the scale would be a continually progressive one, and show no decrease after the 60th year. At that time conditions intervene, in the same way as they do for phthisis, the relative frequency of which, compared with the total number living, increases steadily, according to Wurzburg, with the increase of age.

---

* Quoted by W. Hayle Walshe. The nature and treatment of cancer. London, 1846, p. 146.

† 162 cases.

The frequency of cancer does not seem to be influenced by *sex;* at least a collection made by Fox of the statements of seven different authors on the subject shows that in 1,303 cases, 680 were men and 623 women, thus making the numbers almost equal, if we consider the unavoidable accidents in statistics on so small a scale. Ledoux-Lebard * gives statistics taken from the bills of mortality in Vienna, which show the annual death-rate of both sexes to be almost equal (100 in 25,000 deaths per million of inhabitants). Welch reckons 1,233 men and 981 women in a total of 2,214. If it be true, as is generally supposed, that ulcer of the stomach may develop into cancer, and that women are peculiarly subject to ulcer of the stomach, these statistics, in which women are actually in the minority, prove that the above-mentioned process is not of frequent occurrence.

It would be of the utmost importance if we could gain an accurate and definite idea of the *heritability of cancer.* This question is one of vital importance, not only in diagnosing a suspected case, but also for the prognosis of children whose parents have died of cancer; and you will, of course, understand that in saying this I include cancer of the stomach under the general heading of carcinomatous diseases. All authors who, up to the present time, have turned their attention to the history of the origin of carcinoma—you will find a good account of these discussions collected by J. E. Alberts †—agree that cancer is hereditary, that is, there is a hereditary predisposition to cancerous disease, which a child inherits from its parents, and which is liable to manifest itself under certain conditions. The important thing is to find out what those conditions are which influence the inherited predisposition and the later development of the actual disease, and how often those concerned fall victims to it; in other words, how often the children of parents who have suffered from cancer develop the disease, and whether any or what causes can be found to account for their doing so. It is remarkable that this most essential and practical side of the question has hardly been touched upon in the books written on the subject, although we have every-day experience of its immense importance. But in this case we are driven, in the absence of trustworthy statistics, to depend almost exclusively on opinions. The questions put by the relations of those who have died of cancer are answered in a very different manner by different physicians, but for the most part they incline to believe in heredity.

---

* Ledoux-Lebard. Arch. gén. de méd., Avr. 1885.

† J. E. Alberts. Das Carcinom in historischer und experimentell-pathologischer Beziehung. Jena, Fischer, 1887.

The life insurance companies, with whom it is naturally a question of great importance whether cancer is hereditary or not, do not generally consider the death of a parent from cancer to be sufficient reason for refusing to insure the life of an applicant, but raise their premiums in consequence, and justify themselves in so doing by an appeal to practical experience, which has shown, for instance, in the case of the Life Insurance Company of Gotha, that during the fifty years between 1829 and 1879, out of 334 cases of cancer 31=9·3 per cent., have been hereditary; and so experienced an observer and practitioner as Lebert expresses the opinion—which is in accordance with that of many older physicians—that when it is possible to trace the state of health of whole families during a long course of years, undeniable cases of hereditary cancer may be observed. Cancer of the stomach may be not only directly transmitted from parents to children, but it is still more usual for the parents to have suffered from carcinoma in another form, especially from cancer of the uterus or mamma in the case of the mother. Lebert, in the course of his observations, has found 7 per cent. to be hereditary. The case of the Napoleon family is well known and constantly quoted, in which the first Napoleon, his father, and his sister Caroline all died of cancer of the stomach, which appeared in the family in two generations. But in these and similar statements no attention has been paid to the question of how often cancer appears in families in which it is not hereditary. H. Snow,* surgeon to the London

---

* H. Snow. Is cancer hereditary? Brit. Med. Journ., Oct. 10th, 1885.

Cancer Hospital, has answered the question in this way, that out of 1,075 patients suffering from cancer in different parts of the body 169=15·7 per cent., stated that cancer was in their family, not always meaning that they had inherited it directly from their parents, but that more than one member of the family had already suffered from it. On the other hand, out of 175 persons who were being treated for non-cancerous complaints 46=26 per cent., stated that cancer was in their family, and in two other sets of 78 and 79 persons, the first healthy, the second suffering from pulmonary complaints, the percentage with regard to this question was respectively 19·2 and 11·3. Statistics of this kind are, no doubt, highly untrustworthy, as there is nothing to prove that the patients referred to have not, or may not yet fall victims to carcinoma; but they, at least, show that when a disease is so common as the one we are now discussing, there is much room left for coincidence, and that it is well not to lay too much stress on the theory of heredity in any case which we may be called upon to treat.

With the question of the heredity of carcinoma of the stomach, we have already touched upon the question of the *special reasons which cause carcinoma of the stomach.* As a rule its origin in this place is as mysterious as in any other, and if we bring before your notice a series of causal factors, so called because in a number of cases we have observed a coincidence in time, and a more or less distinct transition, which we designate as cause and effect, we must, on the other hand, leave the question unanswered why these causal factors sometimes produce a cancerous proliferation, and at others are without result. But at the same time, we should lay stress on the fact that some of the causes which we shall mention appear too frequently for it to be possible for them to be without significance for the origin of cancer. This question cannot be properly discussed here, as it belongs to the discussion of the nature of carcinoma and to the domain of general pathology. At present it is no more than a supposition that the origin of cancer is due, not as Cohnheim supposed, to a stray embryonic germ, but may be traced to the injurious action of micro-organisms; but this supposition has found supporters in Alberts, Schill, and Scheurlen,* whose experiments, however, have up to the present time been without result.

---

* Alberts, l.c. p. 183, et seq.; and Scheurlen, Verhandl. d. Vereins f. innere Med. of 28 November, 1887, in Deutsche med. Wochenschr. No. 48.

I must here refer you to the text-books of morbid anatomy. We will confine ourselves to the brief enumeration of a few etiological causes. They are all of an irritative character, whether this irritation is produced by sharp substances or by the action of acute or chronic inflammation. To this class belongs corrosion with nitric acid, a case of which is said to be mentioned by Andral (the passage, however, quoted by one text-book from another is not to be found in the place referred to!) To this class, too, belongs corrosion with arsenic, which Dittrich looks upon as a cause, but which is, however, of very doubtful nature, as Walshe observed a case in which there was a large quantity of encapsuled arsenic in the stomach without any further change having taken place in the wall.* Injuries have been repeatedly asserted to cause cancer of the stomach. Alberts† mentions, for instance, the following case: "A gentleman, fifty years of age, who had never been ill before, stumbled and fell, giving himself a blow in the stomach with the handle of his umbrella. Three weeks afterwards he complained of pains in the stomach, and at the end of a year the patient died of carcinoma ventriculi." But it is evident at the first glance that this and similar cases cannot be relied upon as circumstantial evidence, or can settle the question with any degree of certainty. Who can say that the carcinoma was not latent, and only developed more quickly in consequence of the irritation caused by the blow? Inflammatory conditions of the mucous membrane of the stomach have long been reckoned among the causes of cancer of the stomach. Statements corresponding with this view are found in the writings of Boerhaave and van Swieten, and occur with greater frequency in the earlier works on medicine, in proportion to the vagueness of the ideas which were entertained with regard to the nature of cancerous tumours. But Schuchardt,‡ one of our most modern authors, has written "Contributions to the origin of cancer from chronic inflammatory conditions of the mucous membrane," and considers the formation of a tumour to be preceded by a chronic inflammatory or hyperplastic condition highly favourable to the formation of carcinoma, although not absolutely causing it. Chronic ulcer of the stomach too is one of the factors which favour the formation of cancer. Lebert has observed the direct transition from ulcer to cancer, and Dittrich has seen the association of both forms of disease. Brinton mentions cases which when seen with the naked eye looked like ulceration with thickened edges, but in which there were unmistakable metastases in the liver and lungs, and he says that an open ulcer occasionally causes the development "of cancerous cachexia."[*] C. Meyer[†] describes a case of ulcus simplex combined with cancer, which showed only in the immediate neighbourhood of the ulcer epithelial nests as barely visible nodules taking their origin from the epithelium of the gland-ducts, and Heitler[‡] reports three similar cases (without microscopic examination), with the remark that the diagnosis of "carcinoma ventriculi ad basim ulceris rotundi" is not a rare thing in Vienna. Hauser[§] has brought direct histological proof of the transition from ulcer to carcinomatous proliferation, and maintains that in a case examined by him there was not only the secondary development of cancer in a chronic ulcer of the stomach which had been there for an indefinite time, but even goes so far as to say "that cancer of the stomach may occasionally arise from disease of the gastric glands, in accordance with the theory which Thiersch and Waldeyer have propounded with regard to cancer." In a dissertation published by the Institute of Morbid Anatomy at Munich, Flatow[||] reports upon a similar case, which is rendered more important by the fact that the patient was only twenty-six years old, and the history of ulcer was beyond doubt. The carcinoma in question was situated in the neighbourhood of the pylorus, and had an old scar in its centre with a smooth base. "It is evident," says Flatow as the result of his histological examination, "that a cicatricial patch existed first, and that this was the factor which favoured the development of an atypical epithelial proliferation." But on the other hand, with regard to chronic irritation of the mucous membrane which is said to give rise to the development of carcinoma, the numerous cases in which this result has not been produced are so well known, that it is not necessary to go into the subject and prove the untrustworthy nature of the statements which have been made. When Beau* says that carcinoma of the stomach is often preceded by a period of "idiopathic dyspepsia," I should wish to change the word "often" into "seldom." It is, on the contrary, astonishing to hear how often patients suffering from cancer of the stomach state that they have never had anything the matter with their stomachs before, and have always been most moderate in eating and drinking. While the "gourmand" to a certain extent draws down upon himself the punishment of dilatation of the stomach, those suffering from cancer of the stomach have not even the melancholy satisfaction of thinking that their stomachs were a special source of gratification to them when they were in good health!

---

* Walshe, l.c. p. 167.

† l.c. p. 195.

‡ Schuchardt. Beiträge zur Entstehung der Carcinome aus chron. entzündlichen Zuständen der Schleimhäute und Hautdecken. Volkmann's Samml. klin. Vorträge, No. 257.

---

[*] l.c. p. 243.

[†] C. Meyer. Ein Fall von Ulcus simplex in Verbindung mit Carcinom. Inaug.-Dissert. Berlin, 1874.

[‡] Heitler. Entwickelung von Krebs auf narbigem Grunde im Magen und in der Gallenblase. Wien. med. Wochenschr. 1883, No. 31.

[§] Hauser. Das chronische Magengeschwür und dessen Beziehung zur Entwickelung des Magencarcinoms. Leipzig, 1883, pp. 70 and 73.

[||] H. Flatow. Ueber die Entwickelung des Magenkrebs aus Narben des runden Magengeschwürs. Inaug.-Diss. München, 1887.

Gentlemen, you must excuse me if I do not enter very deeply into the subject of the

MORBID ANATOMY

of cancer of the stomach so far as its histology is concerned. My experience on this point is not extraordinary, and I could only repeat to you what you will find described in many places more or less in detail. Waldeyer first, on the basis of very thorough examinations, taught that cancer of the stomach proceeds from the glandular elements of the mucous membrane, from the peptic glands, and especially from the mucous glands of the pylorus. An atypical proliferation of the glands takes place, which leads to rupture of the muscularis mucosæ and consecutive proliferation in the submucosa. In this place there is a formation of circumscribed cancer nodules which subsequently grow into each other, and thus cause the superficial spreading of the carcinoma. An active proliferation of the connective tissue goes on at the same time, which sometimes precedes the typical proliferation of the gland ducts, and leads first to hypertrophy of the connective tissue, the glandular elements emaining in their normal condition, sometimes takes its course at the same time as the proliferation of the gland ducts, and shows itself as a small-celled infiltration around the cancer mass. The formation of this proliferation of connective tissue seems to be influential in determining the nature of the carcinoma which is developing, whether scirrhus, medullary or colloid cancer. But as I said before, I will merely touch upon these processes, and just mention that in the stomach we meet with the most various forms of cancerous formation, with *scirrhus*, *medullary carcinoma*, *colloid*, *villous*, and *telangiectatic cancer*, and that according to the unanimous statements of all authors who have written on the subject, the first is by far the most common, appearing, according to Brinton, in about 75 per cent. of all cases, while colloid cancer appears in only 2—8 per cent. If we agree with Waldeyer,[*] that cancer is in its nature "an atypical epithelial formation, which has its origin in that tissue," we shall look upon the above-mentioned individual forms as merely different manifestations of one and the same fundamental process, which may, and often do, pass into each other.

---

* Beau. Gazette des Hôpit. 1859, p. 390.

Scirrhus, carcinoma simplex s. fibrosum, with preponderating development of firm connective-tissue-like stroma and comparatively few cell nests, on which account it is hard and firm, sometimes takes the form of large knobs or lumps, sometimes of nodules which are occasionally multiple, but more often the form of diffuse infiltration. Grating under the knife, it exposes to view a tissue almost as hard as cartilage, of pure white, grey yellow or pale yellow colour, with yellow or reddish mottling, but it may, too, be smooth and shiny, almost like bacon, on the surface.

Where there is an inclination to ulceration, a widespread vascular network and diffusely-extended redness will be found, and when the ulceration has already set in there is an indented, ulcerated surface, split up in different directions, and covered with greenish yellow or blackish detritus. As a rule, there is found to be fatty degeneration and contraction of particular parts, while in others the growth is progressive. A small quantity of turbid, milky cancer juice may be squeezed out under strong pressure.

[*] Waldeyer. Die Entwickelung der Carcinome. Virchow's Arch. Bd. lv. p. 54.

Medullary carcinoma is soft, with little connective tissue stroma, but is more vascular and has more abundant cells; it forms more spongy growths, may be easily cut through, has a whitish yellow colour and consistence, something like brain substance, and is more subject to fatty and colloid degeneration than scirrhus. Hæmorrhages are frequent, and are followed by the corresponding discoloration.

If the cells show from the first a tendency to colloid transformation when the stroma is otherwise well developed, the entire mass will acquire a colloid, gelatinous appearance, and the *carcinoma colloides s. alveolare s. gelatinosum* will be developed, which, when cut and scraped, does not yield juice proper, but only granular gelatinous matter.

Carcinoma villosum arises from the villous papillary growth of the scirrhus or medullary cancer; the *teleangiectatic cancer, carcinoma s. fungus hæmatodes*, is produced by development of vessels. Copious effusions of blood in the cancerous tissue may cause any form of cancer to end by assuming the character of *melanotic cancer.* I have already said that mixed forms of these different fundamental types appear in the greatest possible variety.

In all these forms the muscular bundles are more or less densely infiltrated with cancer and hypertrophied. The muscularis becomes paler, less elastic, and more liable to tear; it is, however, sometimes atrophied. The serosa is attacked by secondary inflammatory processes, causing thickening and invading the neighbouring organs.

This brief description is merely intended, gentlemen, to recall the various forms of cancerous growth to your minds. I will now, with your permission, speak more fully on the subject of the localisation of cancer and the conditions which are dependent upon it.

To begin with, we must distinguish between tumours which grow superficially and affect large portions of the mucous membrane, and those which are confined to circumscribed parts. The former, which are greatly in the minority, are composed chiefly of medullary and colloid carcinoma. They are nodular or tubercular in shape, or else scobiniform, more inclined to a flat than an elevated surface, and are distinguished by their tendency to villous formation and hæmorrhage, as well as by their inclination to extend to the neighbouring organs, especially the peritoneum and omentum. In such cases, almost the whole extent of the stomach, from the cardiac orifice to the fundus, may be changed into a new growth, but this must always be looked upon as a rare occurrence. The greater curvature generally remains free, and the cancer has a tendency to extend along the posterior wall, following the course of the lesser curvature. As a rule, the organ is not dilated, but rather contracted into a solid sausage-like tumour. I have made an autopsy in such a case, where the stomach was invaded by medullary carcinoma extending over the whole organ, and its cavity barely contained 200 cc. of water. The scirrhus form of cancer extends over the whole organ, far more rarely than the medullary form, so I give you on the next page a representation of a scirrhus infiltration of this kind, taken from Carswell's atlas (fig. 12). Scirrhus cancer generally shows the second peculiarity mentioned above; it is confined to a small, circumscribed portion of the stomach, in accordance with its tendency, in contradistinction to the medullary and colloid forms, to grow less on the surface than upwards and downwards. But this does not exclude the possibility of a multiple growth in different parts of the mucous membrane, and it may, for instance, appear simultaneously at the pylorus and the lesser curvature or the cæcal pouch.

With regard to the position of cancer, the various statistics are fairly unanimous in showing that in about 50 per cent. of cases the cancer is situated at the pylorus. Brinton gives 60 per cent., Lebert 59·6, Katzenellenbogen [*] 58·3, Luton [†] 57 per cent., &c. In between 10 and 11 per cent. (according to Luton, 7·8 per cent.) of cases, the cancer is situated at the cardiac orifice or the lesser curvature, and in the rest it is divided between the greater and lesser curvatures. The fundus is the part most rarely attacked. Tüngel [‡] describes a case of this kind in which the cancer extended to the spleen. Welch, out of 1,300 cases, reckons 19 in which the cancer was situated in the fundus. At any rate, the orifices are attacked in the

---

[*] Katzenellenbogen. Beiträge zur Statistik des Magencarcinoms. Inaug.-Diss. Jena, 1878.

[†] Luton. Nouv. dictionnaire de méd. Paris, 1871.

[‡] Tüngel. Klin. Mittheilungen aus dem Hamburger Krankenhause, 1860, p. 108.

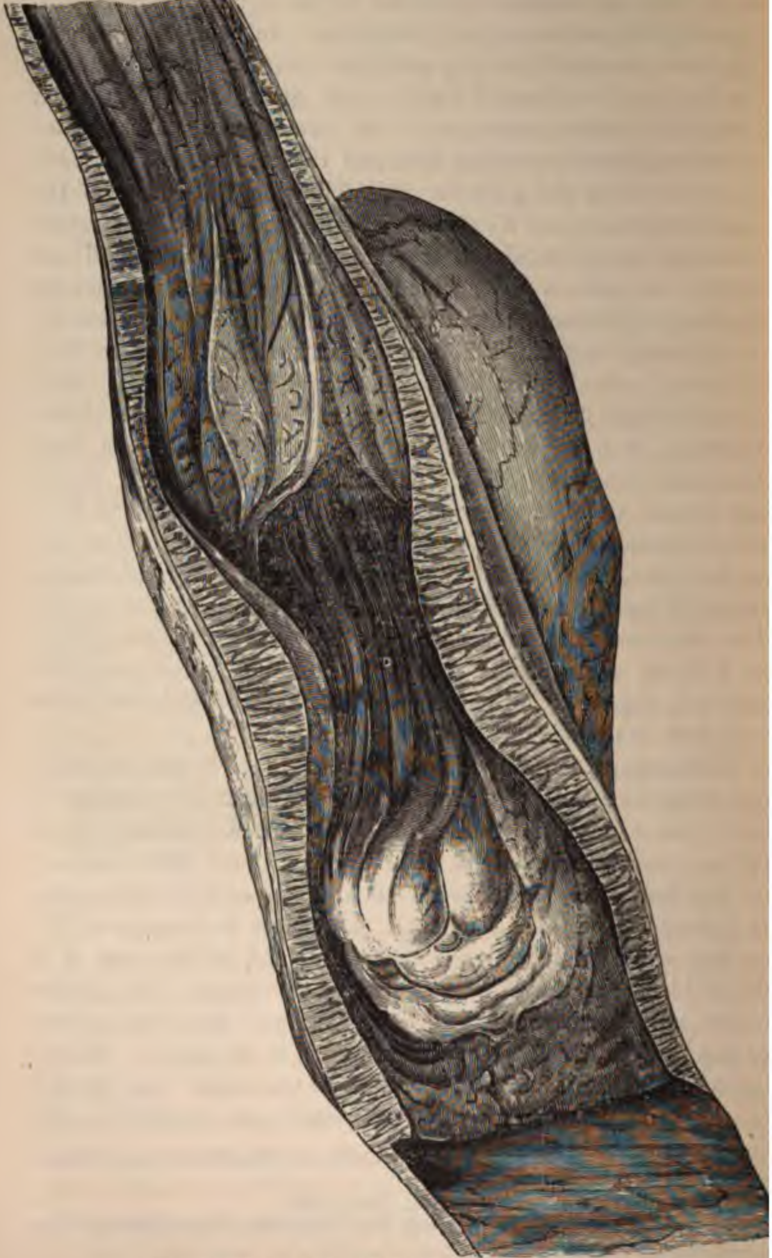


Fig. 12.—Scirrhus ventriculi (reduced by one-fifth).

majority of cases, about 70 to 75 per cent., which shows that cancer is essentially different to ulcer with regard to the places in which it most frequently appears, the orifices being attacked by ulceration about five times less often, that is to say, in 16 to 18 per cent. of all cases.

The situation and extent, as well as the constitution of the tissues of the tumour, determine the form and position of the stomach in the following manner:—

1. Atrophy of the organ arises either from concentric contraction, caused by the infiltration of the entire stomach, including mucous membrane and muscular coat, with a hard growth, which also at times, as in the preparation represented in fig. 12, grows into the cavity of the organ, or it results from a well-marked stenosis situated at the cardiac orifice. Then the normal pressure of the contents of the stomach on its wall is removed, and following the tendency of its contractile tissues it is drawn together into the smallest possible compass, and may be as in a case described by Canstatt,* no larger than a contracted colon. I have made the accompanying drawing from a case observed by me (fig. 13).

During the life of the patient, the pancreas and stomach could be palpated like a hard nodular tumour through the relaxed abdominal walls.

2. An obstructing pyloric tumour will always be followed by dilatation. Stenoses may be caused by the utmost variety of space-constricting factors, which have been minutely discussed in the chapter on dilatation of the stomach.

3. Displacements produced by the weight of the tumour, which may cause either the fundus, or the pylorus, or both, to be dragged down into the true pelvis and made to adhere to the organs situated there, the ovaries, the uterus, bladder, &c., by a process of inflammatory adhesion.

4. Traction, flexion, and contraction of the organ which may result from inflammatory adhesion to the neighbouring organs, or from spreading of the tumour in the stomach itself.

These conditions may alter the form and position of the stomach in a great variety of ways.

Cancer of the stomach is primary in such a very large majority of cases, that a case mentioned by Cohnheim, in which the primary focus was formed by carcinoma of the breast, is one of those rare exceptions which are quoted over and over again. It is not unusual, on the other hand, for cancerous tumours to be discovered simultaneously in two remote parts, for instance, in the uterus or in the ovaries, without any evidence, at least, to point to one or the other as primary. Dittrich has never observed the simultaneous appearance of cancer in the stomach and in the uterus. A short time ago I made an autopsy in a case in which there was an enormous cysto-sarcoma of the uterus and a carcinomatous growth at the pylorus. It is well known, however, that secondary cancerous metastases are not uncommon. In about 75 per cent. of cases the whole organism suffers a metastatic infection from carcinoma of the stomach. In 25·6 to 30 per cent. of cases the liver is attacked, the peritoneum in from 13·7 to 22·7 per cent., the lungs and pleura in 0·6 to 6·2 per cent., while in one hundred and sixty cases described

---

* Canstatt. Klin. Rückblicke. Erlangen, 1851, p. 178.

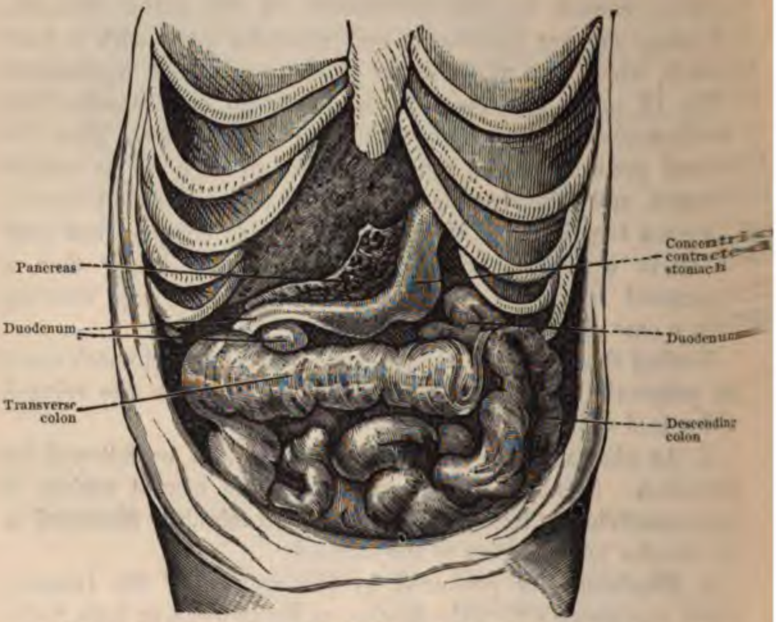


Fig. 13.—Mr. T. died the 10th of April, 1885. Carcinoma of the cardiac orifice. Contraction of the stomach.

by Dittrich the rectum was only affected twice and the ovaries once. But the capricious character of such statistics, which depend upon the opportunities for observation enjoyed by each individual author, is proved by the fact that Lebert gives the following scale for the frequency of the above-named metastases: liver 40·9 per cent., peritoneum 37·5 per cent., lungs 8·3 per cent., ovaries 4·5 per cent.; while Lange,* as the result of an analysis of two hundred and ten cases in the Pathological Institute at Berlin, gives another set of figures, namely, 30·9 per cent., 17·6 per cent., 0·71 per cent., and 0·14 per cent. It is of greater practical interest to trace the simultaneous appearance of metastases in two principal organs, in the liver and the lungs for instance, which Lange observed ten times, that is to say, in 4·7 per cent. of cases. Brinton maintains that the appearance of secondary cancerous deposits in the liver decidedly lessens the risk of the transmission of the disease to the lungs, but it seems more natural to assume that the existence of two foci of infection, in the liver and in the stomach, would increase the chances of the spread of infection through the vessels, although my own experience compels me to agree with the opinion of Brinton.

At the present time no special discussion is needed to prove that cancer and tuberculosis do not, as was formerly supposed, mutually exclude each other, and cannot be simultaneously traced back to a scrofulous diathesis. Not to mention statistical data—as, for instance, those given by Lange, which show a combination of cancer and tuberculosis in 8·1 per cent. of cases, but which still leave room for doubt—the appearance of tubercle bacilli in pulmonary deposits has been observed simultaneously with cancer, although under certain conditions it is not easy to decide whether sundry little cavities in the lungs belong to softened tubercles or metastatic carcinomatous nodules.

In many of these cases the propagation of cancer can only be explained by its metastatic transmission through the blood and lymph vessels; in others, as, for instance, when a carcinoma of the pylorus attacks the border of the liver or the gall bladder, a carcinoma of the greater curvature attacks the colon, or a tumour of the cardiac orifice attacks the diaphragm and the lungs, one is inclined to assume an encroachment *per contiguitatem*, or by extra-vascular means (Carswell and Virchow).[*]

---

* **Lange.** Der Magenkrebs und seine Metastasen. Inaug.-Diss. Berl. 1877.

The formation of thrombi in various parts remote from the stomach, is also an occurrence which, in so far as it is not traceable, as in the veins of the lower extremities, to the influence of cachexia, or the altered constitution and retarded current of the blood, is effected by removal of fragments through the circulation. It has repeatedly been maintained that there is a change in the constitution of the blood, and especially a diminution of the red blood corpuscles and the solid component parts of the serum. We shall return to this point in discussing symptomatology. According to Andral and Gavaret[†] the amount of fibrin is a varying one. There is nothing specific, however, in these variations, which to a greater or less degree are proper to all cachectic conditions.

Finally, the swelling of the lymph glands must be mentioned, as it appears less constantly in cancer of the stomach than in the case of any growth closely connected with the glandular apparatus, for instance, with the mammary glands, and according to Brinton it is observed in only 23·5 per cent. of all cases, while Welch's statistics give a percentage of 35. It is necessary, however, to distinguish between simple swelling and cancerous degeneration of the lymph glands. The latter occurs much more frequently, if we take into account not only what may be seen and felt externally, but also the disease of the entire system of lymph glands. Lebert gives the high percentage of 54·5. According to Katzenellenbogen it occurs less frequently, namely, in only 40 per cent. of cases. As far as my experience goes, the swelling of the supraclavicular glands, the significance of which was, at one time, urged by Henoch and by Virchow, and which has since been frequently adduced as a pathognostic symptom, is rare and by no means constant.[‡]

The ulceration of cancer of the stomach is very various in extent, sometimes appearing only as multiple ulcers on the surface, sometimes as a single ulcer of round or oval shape, and often having a deep crater-like formation with thick wall-like edges. It is most frequent in the soft form of medullary cancer, less so in scirrhus, and least of all in colloid cancer. Although it usually has a progressive tendency, cancerous ulcers may be found the centres of which are completely skinned over, and which have thus given occasion to the legend of the curableness of cancer, although the formation of new cancer-nests is going on the whole time in the circumference. Hæmorrhage of greater or less extent, with the consequences to the tissues which result therefrom, may be caused by the erosion of vessels. When the mucous membrane is completely destroyed, the submucous connective tissue will be found to be covered with black, crape-like remains of the mucous membrane, or is sometimes quite bare, with a few vascular loops at rare intervals upon its surface. The villous, fungous proliferations on the surface of a cancerous ulcer, which, however, must be distinguished from non-malignant polypi of the mucous membrane, are traceable to similar processes.

---

[*] Virchow. Die krankhaften Geschwülste, 1, p. 54.

[†] Andral and Gavaret. Rech. sur la composition du sang, p. 238.

[‡] Troisier. Les ganglions sus-claviculaires dans le cancer de l'estomac. Gaz. hebdom. 1886, No. 42.

One consequence of ulceration is perforation of the neighbouring organs, which, however, does not often take place, according to Brinton in barely 4 per cent. of cases. The bowel and peritoneum are most frequently affected, and communications of considerable extent are found between the stomach and the bowel, especially the transverse colon. If the perforation has been preceded by adhesive inflammation of the peritoneum, it may under certain conditions take the form of an encapsuled sac, and in rarer cases may burst through the abdominal wall in the form of an ulcer. According to a collection of statistics made by Mislowitzer, only sixteen cases of this kind have yet been published, to which may be added a seventeenth observed in Gerhardt's wards.* Dittrich observed a case in which a perforation had penetrated the ileum after the pylorus was completely closed, thus making a natural outlet in place of the pylorus, which is what we, under favourable conditions, endeavour to do by means of an operation.

GENERAL ASPECT OF THE DISEASE.

Cancer of the stomach is an exquisitely slow and creeping disease, and in its earlier stages cannot be distinguished from other affections of the organ which lead to dyspepsia. Brinton's brief description, "Obscure in its symptoms, frequent in its recurrence, fatal in its event," is still correct, in spite of the numerous additions which have since been made to our diagnosis and treatment. Irregularity and decline of appetite, slow, deranged digestion, feelings of fulness, oppression, and tension in the region of the stomach, as well as eructation and an inclination to nausea, accompanied by inveterate constipation, are the preliminary symptoms. Then come pains in the stomach, either local or diffuse, sometimes partaking of the nature of cardialgia; vomiting occurs, usually without much effort, and not accompanied by extreme nausea. The tongue becomes foul, is covered, particularly in the morning, with a hard white coating, which is difficult to rub away, and which quickly reappears. The results of my experience do not lead me to agree with Lebert that the tongue is rarely found to be foul, and that this is one of the important paradoxical symptoms of cancer of the stomach. I too have seen cases in which the tongue was comparatively free, but they are rare exceptions. The covering of the tongue with a foul coating, whether *in toto*, or with the exception of the edges and individual papillæ which stand out like red berries, is on the contrary a typical differential sign which should be made use of to distinguish between cancer and ulcus ventriculi. The complete loss of appetite is preceded by a strange distaste for meat, and other anomalies of the appetite or taste. (One of my patients said that his red wine tasted all at once like ink. In a case attended by Brinton, a confirmed smoker suddenly lost all taste for tobacco. This, combined with a cachectic exterior, caused the physician to assume the existence of cancer, which was afterwards proved to be present, although other symptoms were not in favour of the supposition.)* The taste becomes insipid, pap-like, bitter or acid, or putrid, in spite of all efforts to clean and wash out the mouth. The pain becomes more intense, sometimes taking the form of paroxysms, and comes on not only after the scanty meals, but also during the intervals when no food has been taken, and in the night. Vomiting becomes more frequent. While at first the matter brought up consists chiefly of mucus, chyme, and watery fluid mixed with bile, the remains of food will, as time goes on, be brought up less and less changed. The matter brought up is sometimes insipid, sometimes acid, has a pungent or putrid smell, and in cases where there is perforation into the bowel, it has been known to have a fæcal odour.

---

* E. Mislowitzer. Ueber die Perforationen des Magencarcinoms nach aussen. Inaug.-Diss. Berlin, 1889.

---

* l.c. p. 195. Although Brinton calls this diagnosis a "matter of professional instinct," it seems to me to have been more a "matter of chance."

It is not only mixed with numerous epithelial cells and micro-organisms, but frequently with blood also, either in small quantities in bright red streaks mixed with mucus, or in larger quantities of clotted blood of bright red or reddish brown colour, or in clots and small lumps, varying in colour from brownish chocolate to black—the celebrated coffee grounds material—according to the time which the blood has remained in the stomach, and the more or less strong decomposing influence exercised upon it by the contents of the stomach.

The character of the hæmatemesis is not pathognostic, as was formerly supposed, when it was believed that the vomiting of matter like coffee grounds was a specific occurrence in cases of cancer of the stomach, but it must be confessed that in such cases the blood remains longer in the stomach than it does in other diseases which lead to hæmorrhage, and may on that account undergo certain changes of condition (fig. 14).*

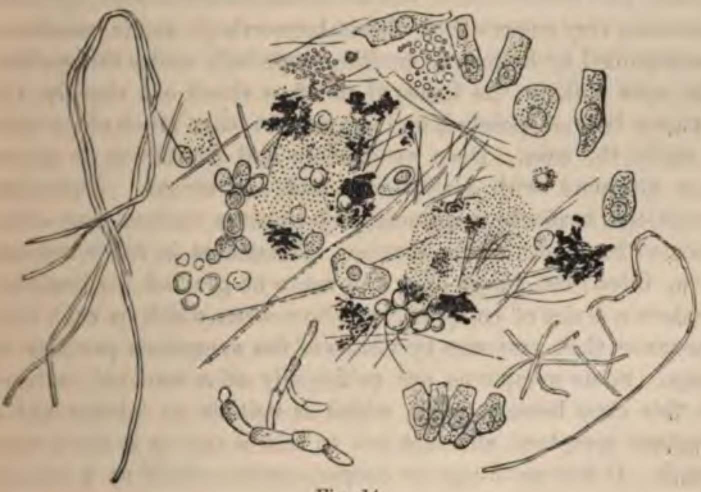


Fig. 14.

---

* Description of fig. 14. The matter brought up consisted of a clear reddish fluid, with a slightly flaky sediment, in which a number of particles something like snuff were suspended. The filtered matter contained no free acid, but small quantities of lactic acid. Does not digest without the addition of hydrochloric acid. In the microscopic preparation are found outlines of blood corpuscles, granular matter dyed brown by the action of hæmoglobin,

At this stage, in many cases, a palpable, or both palpable and visible tumour will appear, usually in the triangle formed by the costal arch and the *linea umbilicalis*, in men indeed somewhat higher, in women, owing to the low position of the liver, somewhat lower.

A great decrease in strength, not corresponding with the other subjective complaints of the patient, takes place at an early stage, and is followed by increasing loss of weight, noticeable from month to month, accompanied by marked atrophy of the panniculus adiposus and the muscular system, which gradually leads to the most extreme marasmus and complete exhaustion. One of my patients who had a distinct tumour, but whose subjective symptoms were remarkably good, first complained of a feeling of weakness in the legs when he walked upstairs. The specific pale yellow tint of the cancerous cachexia soon appears, becoming very anæmic after violent hæmorrhage, and is sometimes accompanied by hydræmic swelling, especially under the eyelids. The eyes sink in, the bones of the face stand out sharply, the features become pointed, and the patient looks much older than is really the case. Deep melancholy and depression of spirits may alternate with restlessness and excitement. Neuralgic conditions, headache, giddiness, and tinnitus aurium may complicate the aspect of the disease. Metastases in other organs, liver, intestines, lungs, &c., and acute or gradual perforations, produce a series of complicating phenomena which in each case announce their presence by means of the symptoms peculiar to them. Some symptoms are principally of a terminal nature. To this class belongs fever, which is neither an intense nor a constant symptom, although not so rare a one as is often supposed. It has an irregular course, confines itself as a rule to

---

epithelial cells of the œsophagus and stomach, partly suggestive of rennet cells, others exquisitely cylindrical. Saccharomyces and cells of another hyphomyces, probably an aspergillus. Finer and coarser fungus fibres, the thick mycelium of which, merely indicated in the illustration, really enframes the brownish granules already mentioned, which are visible to the naked eye. Numerous micrococci and droplets of fat. The curious fibres, suggesting elastic fibres from the lungs, which are to be found at the left of the illustration, are derived from the connective tissue of meat which has been eaten. I have repeatedly observed them, even in artificial digestion of meat. The patient states that for three weeks he has only drunk milk. The truth of this statement cannot be doubted; but the results of the examination show what a length of time such remains may lie in the folds of the mucous membrane.

between 38° and 39°, seldom rises beyond 40°, and may, as I have observed in one case, be completely hectic in character; sometimes periods entirely or almost entirely free from fever alternate with those in which it is violent, which latter condition is caused by the appearance of secondary inflammations. On reviewing the subject, I see that Hampeln,[*] in an essay which is well worth reading, on the symptomatology of occult visceral carcinoma, has given a minute description of two cases of cancer of the stomach, with intermittent fever amounting to rigors followed by a hot stage and sweating, in which the course of the fever was such as to cause a suspicion of the existence of malaria.

I have lately met with an interesting case of the latter kind in the Augusta Hospital.

A man, forty-seven years of age, admitted into hospital on December 6th, 1888. Illness began two years previously with dyspeptic troubles. In September, 1888, hæmatemesis and loss of blood *per anum*. Was in the hospital on account of "ulcer of the stomach" from October till November, when he was sent away better. The patient now complains of pains in the stomach after eating. On December 3rd violent vomiting, but no hæmatemesis. The patient was put upon milk diet under the supposition that he was suffering from *ulcus ventriculi*, but an irregular fever soon showed itself, which in the evening sometimes rose to 39·6°. The pains in the region of the stomach persisted, and varying in position, were sometimes more pronounced on the right side, sometimes on the left. The contents of the stomach showed no free hydrochloric acid. The patient became more and more emaciated, so that it became possible to feel a small tumour in the right hypochondrium at the border of the liver. Icterus was not present. The diagnosis was made of carcinoma ventriculi et hepatis. On January 5th a violent rigor set in, which returned several times; the pains over the upper abdominal region increased, and from this time till February 20th, 1889, when the patient died in a state of continued fever, well-marked friction sounds might be heard over the border of the liver. We had assumed a perforation of the cancerous ulcer, preceded by adhesive inflammation and adhesion to the neighbouring organs, with circumscribed peritonitis. The autopsy showed that an ulcerated cancer nodule, about the size of an apple, was situated on the posterior wall in the lesser curvature of the stomach, and extended to the diaphragm, and was adherent to it. The surface of the liver was infiltrated with numerous slightly prominent nodules, all of which showed signs of recent adhesion to the parietal peritoneum.

---

[*] P. Hampeln. Zur Symptomatologie occulter visceraler Carcinome. Zeitschr. f. klin. Medicin. Bd. 8, p. 232.

Dropsical swellings and effusions in the cavities of the body must be reckoned among the terminal phenomena, as well as inflammatory processes in the lungs, the pleuræ, and the kidneys. In the later stages of the disease delirium appears intermittently, which must be looked upon as due to exhaustion. Death follows from marasmus after a short agony. The patient long retains his consciousness, but *sub finem vitæ* it fails, so that there is no conscious death struggle.

Gentlemen, as a rule the course of cancer is a gradual one, never stopping till it ends in death. But sometimes shorter or longer periods occur, in which the disease appears to stand still, and even decrease in violence, thus giving rise to diagnostic doubts and confusion. I met with a very striking instance of this kind at the beginning of my professional career.

The case in point was that of a gentleman, sixty-two years of age, who had very gradually become ill with symptoms which pointed to cancer of the stomach, without being sufficient to make a definite diagnosis of that disease. The patient became weaker and more miserable, vomited, had violent pains in the region of the stomach, especially on pressure, with complete loss of appetite and inveterate constipation. A medical quack assured him that he was suffering from a disease of the spleen, and prescribed rhubarb wine, and gruel with stewed plums! But the patient grew better, took his gruel, as I heard afterwards, with a good appetite, was even well enough to go out again, and believed implicitly in his doctor. This went on for about two months, then the old troubles began again, and the patient died in a short time of marasmus. I had an opportunity of seeing him once more shortly before his death, and was then able to observe with certainty a tumour, as large as one's fist, at the pylorus.

I have frequently observed these stages of apparent improvement. They are not unknown to experienced practitioners, and doubtless appear much oftener than the text-books would lead us to expect.

The duration of the disease may vary from three or six months to two, three, or more years; on an average it lasts from six to fifteen months, a quicker course being an exception to the rule. The disease always terminates fatally; cases in which cancer of the stomach has been cured have been frequently asserted, but never proved, and the cases of apparent cure, recorded in literature from the observations of Dittrich, Lebert, Friedreich, and others, must be traced either to the superficial cicatrisation already mentioned, or to confusion with ulcer. In one case of carcinoma of the breast, examined by me, I found in the stomach a radiated scar with thick, callous edges, and great atrophy of the surrounding mucous membrane of the stomach. One was naturally led to look upon the scar as a primary carcinoma of the stomach which had healed, with metastases in the mammary glands. But the microscope proved the case to be exactly the reverse. The base of the scar was composed of firm, fibroid cicatricial tissue, while cell nests were found scattered about in the submucosa close to the edge, which could only be the beginnings of cancerous growth. A new growth (see under ulcer) had developed itself in connection with a cicatrised ulcer, but the possibility of a cicatrised carcinoma was excluded by the fact that transitions such as had here taken place between purely fibroid scars and young cancer tissue, without any intermediate factor, do not occur in a cancerous scar.

Gentlemen, you know as well as I do, that the course of disease just described can only claim to give a general idea of the subject, and that in any actual case there may be many variations from the rule here laid down. Various authors have taken great pains to ascertain by means of statistics the comparative frequency of the several symptoms, and Brinton and Lebert in particular give careful analyses based on a relatively large number of cases. In practice, that is to say, for the diagnosis of any actual case, these statistics are of merely secondary value, and have more interest for the nosology of the disease. However well we may be primed with statistics, we can never be certain that the case in point is not an exception to the rule.

I will now call your attention to the accompanying semi-diagrammatic sketch (fig. 15. R. died March 17, 1874), which illustrates what I have said; it represents a colloid cancer of the lesser curvature, partially hidden by the left lobe of the liver, and according to the nature of the case not palpable *intra vitam*. The patient, a tailor, forty-eight years of age, had, when alive, never complained of pain and never suffered from hæmatemesis. At the time the diagnosis of cancer of the stomach was made in Frerichs' wards, principally as a diagnosis of probability, by the extreme anorexia and progressive cachexia of the patient, as well as by the careful exclusion of all concomitant diseases. The knowledge gained by experience, that hæmatemesis appears in about forty-two per cent. (according to Lebert in only twelve per cent.), and that a tumour is absent in eighty per cent., could in this case be decisive in neither a positive nor a negative sense.

But for the sake of completeness, and because a certain mental foothold is thus obtained, I will not withhold the following statistics from you. They are founded upon the analysis of two hundred and fifty cases by Brinton, and eighty-eight or one hundred and forty-five by Lebert.*

Loss of appetite occurs in forty-five per cent., usually in the later stages of the disease; in rare cases the appetite is increased.

Pain in ninety-two per cent. (Lebert seventy-five per cent.) is frequently absent in the case of old people. According to Brinton interscapular pain is connected with cancer of the lesser curvature. In the above-mentioned cases, observed by me, I find no mention of interscapular pain, and the rest of my experience leads me to consider that the importance of this symptom has been much exaggerated.

Vomiting occurs in eighty-eight per cent. (Lebert eighty per cent.). Most usually when the cancer is situated at the orifices. But a considerable contraction of the pylorus may take place without the occurrence of vomiting. As a rule, it appears at an interval of one, two, or three hours after food has been taken, but may occur much sooner, and in the case of drunkards, or persons whose strength is much reduced, sometimes takes place in the

---

* A. Ott, Zur Pathologie des Magencarcinoms, Inaug.-Dissert. Zurich, 1867, has combined the numbers given in the text with thirty-three cases from Biermer's wards, and has obtained almost identical results.

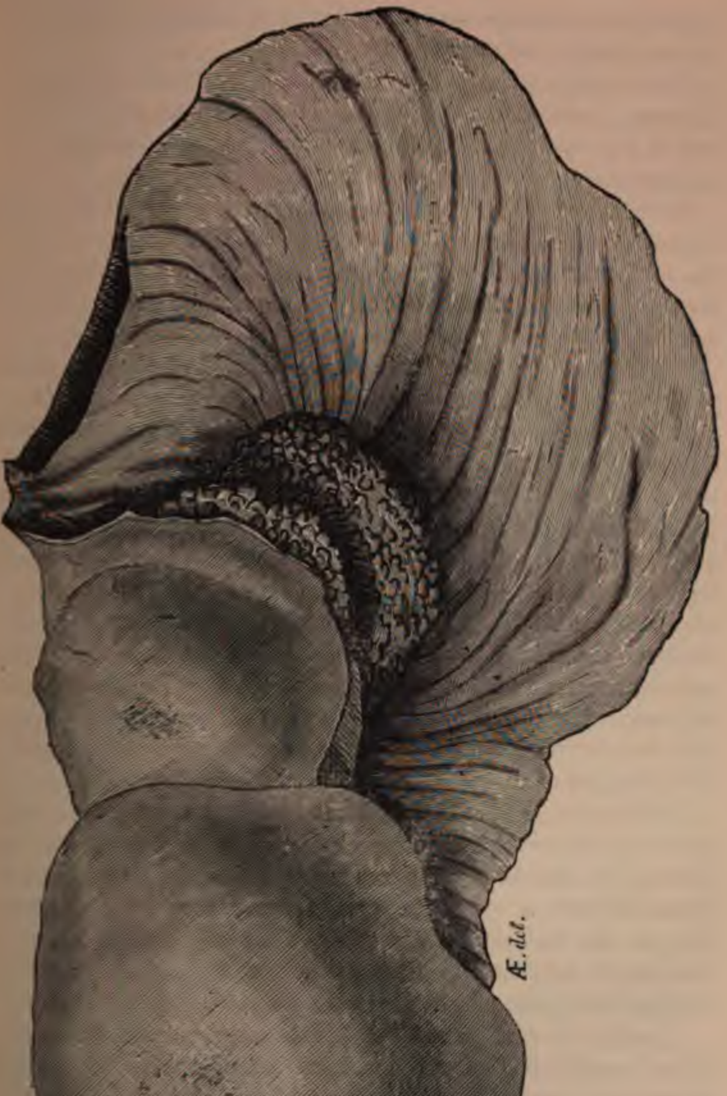


Fig. 15.

morning on an empty stomach. There is nothing typical in the time at which it takes place.

Hæmatemesis is noticed by Brinton in forty-two per cent. of all cases. Lebert, who distinguishes between more copious bleedings of the stomach and melæma or melanemesis proper, only reckons twelve per cent. for the former.

Brinton and Lebert agree in giving a percentage of eighty with *tumour*. As a rule it is not to be felt till between the third and sixth months. Usually it shows itself distinctly only during the second half of the course of the disease, or during the last months of life.

The *action of the bowels* remains regular in only four to five per cent. In by far the great majority there is constipation, or constipation alternating with diarrhœa, which latter symptom is caused by catarrhal irritation of the mucous membrane of the bowel by the hard fæcal masses, or by the products of decomposition which are not removed. A gastro-intestinal fistula may be formed and fæcal masses and gases may pass into the stomach, or it may result in "lientery," that is to say, the passage of undigested food through the bowel. Rampold, however, has observed the existence of a communication between the pylorus and the transverse colon and a loop of the small intestine which lay near, without the patient, a person sixty-six years of age, who was, however, suffering from dementia paralytica, showing definite signs of disease of the stomach.*

Murchison† points out that fæcal vomiting must cease, when the whole contents of the stomach pass into the colon, thus rendering the formation of fæces impossible. In conclusion, we must mention a symptom peculiar to cancer of the orifices: this is, the cessation of the phenomena of stenosis caused by necrosis of the cancer tissue, by which, under certain conditions, an apparent improvement may take place.

Finally, the condition of the blood deserves special attention. After Laache‡ had observed diminution of the red blood corpuscles in cancer of the stomach, and Lépine§ had described the temporary appearance of numerous microcytes which were estimated as constituting half of all the red blood corpuscles,

---

* Rampold. Hufeland's Journal, Part V., 1836.

† Quoted by Henoch, Klinik der Unterleibskrankheiten. Berlin, 1863.

‡ S. Laache. Die Anämie. Christiana, 1883.

§ Lépine et Germont. Note, &c. Gazette Méd. de Paris, 1877, No. 14.

Eisenlohr* and Schneider† discovered, together with the changes already mentioned, a relative and even absolute increase of the white blood cells, so that a condition of the blood resulted, similar to that in cases of pernicious anæmia or even leucocythæmia, and as Schneider says "this easily recognised change in the blood should form an important factor in the differential diagnosis."

The diagnosis of cancer of the stomach.—Gentlemen, although the diagnosis of carcinoma of the stomach is for the most part comprised in what has been already brought under your notice, in the general symptomatology of the development and course of the disease, yet there are some important diagnostic factors which we must not neglect to discuss. With your permission I will begin with one which has lately attracted the greatest attention and given rise to somewhat premature and exaggerated hopes. I mean

1. *The failure of free hydrochloric acid in the contents of the stomach.* Kussmaul's school has done good service in being the first to treat this question in a methodical manner. Although a more accurate knowledge of the subject, gained by the collective labours of numerous inquirers, among whom those of the above-mentioned school are not least, have proved that the opinion originally expressed by R. v. d. Velden, that cancer of the pylorus combined with dilatation leads to failure of the secretion of hydrochloric acid—an opinion soon extended to all forms of cancer of the stomach without exception—is not correct to this universal extent, yet is significant, and with regard to diagnosis and treatment, highly important results have been gained.

Historical justice demands the recognition of an inquirer who many years ago studied the question of the existence of hydrochloric acid in cases of carcinoma so thoroughly, that the knowledge of the results of his inquiries would have spared us many details of the discussion. It is remarkable that his work, which is excellent, considering the time at which it was done, has been forgotten to such an extent that it is never quoted even by his fellow-countrymen. Golding Bird, Physician to the Islington Dispensary and Professor of Medicine at Guy's Hospital in London* in the year 1842, defined the relations of hydrochloric acid and organic acids, in the case of a man, forty-two years of age, suffering from cancer of the pylorus and dilatation (proved by a *post-mortem* examination), by means of a series of examinations of the matter brought up, made according to a method against which no objection can be urged even at the present day.† In the course of about three weeks, three estimations were made, the results of which are thus summed up by Bird: "The matter brought up contains considerable quantities of free hydrochloric acid during the more irritative stage of the disease, which gradually decreases in proportion to the decrease in strength, while the organic acids increase in proportion to the decrease of the free hydrochloric acid." It is remarkable that a control experiment on a healthy person (an emetic of sulphate of zinc was taken half an hour after a moderate dinner) yielded free hydrochloric acid, but only small quantities of organic acids, while another experiment, made on a person suffering from cancer of the liver and dilatation of the stomach caused by the pressure of the tumour on the pylorus, yielded somewhat smaller quantities of free hydrochloric acid, but large quantities of combined HCl and organic acids.

---

* Eisenlohr. Blut und Knochenmark. Deutsches Arch. f. klin. Med. Bd. 30, p. 495.

† G. Schneider. Ueber die morphologischen Verhältnisse des Blutes bei Herzkrankheiten und bei Carcinom. Inaug.-Diss. Berlin, 1888.

There may be some disorder in the relation of free to combined hydrochloric acid and to organic acids in the estimations, owing to want of precision in the food given, and in the time at which it was afterwards brought up, but the conclusions arrived at by Bird are undoubtedly correct and of great importance. Bird himself was fully conscious of this fact, but complained of the time taken by the experiments, and seems not to have pursued them further. They were thus completely forgotten, and it was left to inquirers of the present day to take them up again with new methods.

You know, gentlemen, that a daily increasing number of physicians have devoted themselves to this question. I need only mention the names in chronological order to show how great an interest has been taken in this subject: v. d. Velden, Ewald, Kietz, Thiersch, Riegel, Kahn and v. Mering, Jaworski and Gluczynski, Bamberger, Kraus, Dreschfeld, Rosenbach, Krukenberg, Rosenheim, and many others. Riegel, no doubt, has collected the largest amount of material for the discussion of this question. He has quite lately reported on sixteen cases of carcinoma of the stomach with 306 separate examinations.* It cannot be a matter of interest to you to follow the discussions by individual authors of the disputed points, especially as it seems to me that they are already to a certain extent unanimous, or about to become so. For the disputed question is practically settled now that they are agreed as to what is to be understood by the failure of free hydrochloric acid: the failure of the colour reaction, especially Günzburg's or Boas' test, mentioned in the first lecture, or the result of an analysis founded on strict chemical methods. It is evident that the practical importance of the first-mentioned tests, in so far as they yield a constant result, is not diminished by the theoretical value of the results of the second method. One may maintain, as I have always done, that carcinoma in itself, as an histological new growth, has nothing to do with the partial or complete stoppage of the secretion of hydrochloric acid, and Bird's examinations more than prove this fact *post festum*, but it would be considered a valuable diagnostic test, even if complicating factors interfere with the demonstration—not the actual secretion—of hydrochloric acid. Both are correct. If the carcinomatous new growth, as seen with the naked eye or through the microscope (which is by no means always the same thing), be confined to a small circumference, the accompanying catarrh of the mucous membrane slight, and if there be no atrophy of the mucous membrane, a sufficient secretion of hydrochloric acid may be maintained, till it ceases *sub finem vitæ*, or, as is the case in all cachectic conditions, becomes very slight. But in the great majority of cases it is evident that one of these factors is actively at work, and the secretion of hydrochloric acid either ceases entirely, or is so much diminished that the existence of free hydrochloric acid can no longer be proved by means of our ordinary methods. An excellent diagnostic adjuvant would thus be provided, if, as I might almost say, unfortunately a failure of the production of hydrochloric acid were not possible in other morbid conditions of the mucous membrane of the stomach.

---

* Golding Bird. Contribution to the chemical pathology of some forms of morbid digestion. Lond. Med. Gaz. 1842, vol. 2, p. 391.

† Distillation of the volatile acids, reduction to ash of the remainder, boiling with diluted nitric acid, and estimation of the silver salt with and without the addition of soda.

---

* l.c. p. 430.

To this class belong atrophy of the mucous membrane of the stomach, amyloid degeneration, corrosive poisoning which destroys a great part of the mucous membrane of the stomach, mucous catarrh, and certain neuroses caused by, or connected with disturbed innervation of the glands of the stomach. It is evident, as I said before, that acute injuries of the mucous membrane of the stomach, poisonings, and acute indigestions may lead to failure of the glandular activity, just in the same way as an acute catarrh of the kidney considerably decreases its secretion, or the injection of atropine into Wharton's duct causes the secretion of saliva to dry up. In my own case I have found the contents of the stomach completely free from hydrochloric acid during temporary poisoning with nicotine, and on another occasion when I had breakfasted on board ship and was sea sick about an hour afterwards, the matter brought up gave no reaction with litmus paper. Such conditions are, however, of a temporary nature, and will quickly improve after the removal of the cause, or with appropriate diet. According to the experiments of Wolfram,* in all acute infectious diseases the gastric juice contains no free hydrochloric acid during the course of the fever, and digests neither in the organism nor out of it. We know, too, that in certain chronic complaints, for instance Addison's disease (Köhler), pernicious anæmia, Bright's disease, and many cases of phthisis (C. Rosenthal), the production of hydrochloric acid sinks to a minimum, and that free acid can no longer be proved to exist. But even under physiological conditions very considerable variations may occur in the quantity of acid produced, and as the free hydrochloric acid essentially depends on the quantity of albumen which is transformed into acid albumen, or peptone which absorbs the HCl, or is loosely connected with it, there may sometimes be free hydrochloric acid and sometimes not, with one and the same sort of ingesta, but varying secretive energy of the gastric juice. On this account one must fully agree with Riegel in requiring an examination, extending over a long period and accompanied by appropriate treatment, before a decisive judgment can be given. Under normal conditions, the production and secretion of hydrochloric acid is regulated to correspond with the demands of the ingesta, in such a manner that there is enough hydrochloric acid present to give a distinct reaction with colouring agents, &c.

---

* Published by Gluzinski. Ueber das Verhalten des Magensafts in fieberhaften Krankheiten. Deutsches Arch. f. klin. Med. Bd. 33.

In the large majority of cases of carcinoma of the stomach there is no free hydrochloric acid. This is, however, not caused by the mystic influence of the carcinoma on the production of hydrochloric acid, but simply by the accompanying catarrhal inflammation or atrophic condition of the mucous membrane of the stomach. Should these conditions be absent, there will be a copious secretion of hydrochloric acid, as in Bird's case, a case mentioned by Cahn, and one observed by v. d. Velden which has been subsequently published.* But if a process of this kind in the mucous membrane of the stomach should manifest itself and be strongly developed during the course of our observations, or should the organism become weaker and weaker, thus causing as a natural consequence a failure of the functions of the organ principally affected, a very short time will suffice to effect a change from the presence to the absence of hydrochloric acid. In this way I account for Bird's case, to which I can add the following, observed by myself.

Mr. R., a merchant, forty-two years of age, was privately examined on January 7th; he had suffered for a long time from "chronic catarrh," and for some months had complained of violent burning in the stomach. Was in the Augusta Hospital, and while there treated with the stomach tube and made much better. He learnt to wash out the stomach for himself, and did so frequently, having a tendency to dietary indiscretions, which he tried to make good by means of subsequent washings.

A tall thin man, skin dry, abdomen hollow, bedridden through weakness. Lungs and heart healthy. A small, easily moved tumour, the size of a walnut, at the pylorus, which was little sensitive to pressure. No succussion sounds. The stomach reached as far as the umbilicus when inflated, and the tumour descended downwards to the right side. He brought up through the tube, which he himself introduced, greenish yellow, stale-smelling matter, containing large quantities of mucus of neutral reaction, and therefore containing no free acid. No swelling of the glands. Urine acid, clear. Bowels irregular.

The next morning he took the test breakfast, which *undoubtedly showed considerable quantities of hydrochloric acid*, smaller quantities of lactic acid, peptone, and propeptone. Digestion slow.

---

* Cahn. Verhandl. d. 6 Congr. f. innere Med. 1887, pp. 362 and 373.

On account of the presence of hydrochloric acid the diagnosis was made of non-carcinomatous hypertrophy of the pylorus (formation of cicatrix in an old ulcer, hypertrophy of the muscular wall from chronic catarrh ?).

But on the very next day the patient vomited matter containing blood, and complained again of violent burning in the stomach, and almost unbearable dryness and burning in the mouth, pharynx, and œsophagus. This vomiting was several times repeated in the course of the next three weeks, in spite of a strict diet and regular washing, which each time brought up large quantities of stomach contents, mixed with remains of food, and either stained with blood or containing blood granules. Hydrochloric acid was never found in the contents, but there were, on the other hand, considerable quantities of torulæ, bacilli, and mucus. The reaction was usually neutral, or when acid rendered so by the action of lactic acid or acid salts. A test breakfast was twice given *lege artis*, and here too the failure of hydrochloric acid was observed. The tumour remained in the same condition, and might be more or less distinctly felt, according to the fulness of the stomach. The patient suffered greatly, became very weak, and was most anxious to have the tumour removed by means of an operation. On account of the large quantities of stomach contents which were brought up through the tube—sometimes as much as four or five litres—he was supposed to be suffering from gastroectasy, although a renewed inflation of the stomach with air again failed to give any strongly marked signs of it. I was unable to account for this unusual condition, and communicated to my colleagues the idea which had come into my mind, that the matter brought up might be, not the contents of the stomach, but the contents of the bowel which had flowed back unhindered through the rigid pylorus, no longer capable of closing. According to the wish of the patient resection of the pylorus (Prof. Sonnenburg) was performed on January 30th, about three weeks after the first examination had been made.

A hard tumour, the size of a walnut, was situated at the pylorus, and forming round it had contracted it to such a degree that the tip of the little finger could hardly be passed through.

Some of the lymph glands of the *ligamentum gastro-colicum* were swollen to the size of cherry stones. The stomach was not dilated.

The operation passed off well, and for a few days the symptoms of the patient were good. On the fourth day there was a slight onset of fever, and marked collapse, and on the evening of the fifth day he died. The *post-mortem* examination made by me showed that some of the sutures (catgut and silk) had suppurated, and that an adhesive, circumscribed, purulent peritonitis had developed, which must be looked upon as the cause of death. The mucous membrane of the stomach was hyperæmic in the neighbourhood of the sutures, but otherwise quite uninjured. But, on the other hand, the muscular coat was thickened and infiltrated as far up as the fundus ventriculi. The examination of the portion excised at the operation, which was immediately put into absolute alcohol, afterwards changed many times, showed a scirrhous growth of cancer, essentially confined to the muscular coat, which had infiltrated the remains of the muscular fibres in broad bands. The mucous membrane was for the most part quite intact, or only infiltrated by a slight interstitial, small-celled growth proceeding from the submucosa. In places we observed a more atypical proliferation of the gland ducts, and cysts of different sizes lay in and near the submucosa. But there was no decisive distinction between this and the control preparation of a catarrhal stomach. This was also the case with the preparations of the fundus and cardiac end, which were made after the *post-mortem* examination. The submucosa in the neighbourhood of the tumour could be seen with the naked eye to be a coarse, retiform, fibroid tissue, very clearly divided from the mucosa on the one hand, and the infiltrated muscular coat on the other.

The very great importance of this case is evident. *It shows that when the cancer is localised, and the mucous membrane intact, the secretion of hydrochloric acid may be maintained till shortly before death, and that under such conditions the conclusions based on the proof of the existence of hydrochloric acid are erroneous.* It is also interesting on account of the peculiar conditions observed during the use of the stomach tube. The inflation of the stomach indeed resulted in complete failure, and the large quantities of matter which could be brought up without any effort can only be accounted for in the manner above stated.

There was real, genuine insufficiency of the pylorus, but it is worth while to notice that in spite of this, it was not possible to inflate the duodenum. We shall easily understand this, if we consider how great an amount the duodenum is capable of containing in comparison with the relatively small quantity of injected air. Finally, there is no explanation of the mixture of blood with the contents of the stomach, which *sub finem vitæ* constantly took place; the autopsy shows no tangible reason to account for it, and we are compelled, in this as in similar cases, to assume a general oozing from the vessels.

Since the observation of this case of mine, to which I can now add other similar cases, careful examinations have been made with regard to the relations of hydrochloric acid in cases of cancer of the stomach, of which I will only quote the following. Stiénon* made very careful chemical and anatomical examinations in eight cases of cancer of the stomach, in four of which the colour reaction was negative, while in the other four it was transitory, and more or less distinct. Cahn and v. Mering's method, in the two cases in which he made use of it, yielded a positive result (fourteen estimations), the hydrochloric acid being estimated to amount to between 0·4 and 2·3 per mille, while the colour reaction failed every time. Microscopic examination showed that atrophy of the glands is a frequent if not habitual concomitant phenomenon in cases of cancer of the stomach, and must be looked upon as the cause of the failure of hydrochloric acid. This is true in many, but certainly not in all cases of cancer, because, as experience teaches, the concomitant disease of the mucous membrane may be confined to a more or less extended and more or less intense inflammatory process (catarrh).

Rosenheim, with the help of Cahn and Mering's method, has made an exhaustive study of this question.† Out of sixteen cases of carcinoma, he was in fourteen never able to prove the existence of hydrochloric acid when digestion was at its height; in one case free hydrochloric acid was present for a time, while in the last there was not only an almost constant supply of free hydrochloric acid, but also hyperacidity and hypersecretion; I must, however, call your attention to the fact, that in this last-mentioned case there was an almost complete failure of hydrochloric acid as recognisable by the aid of colouring matter, and the statement that there was hyperacidity rested on the results obtained by the use of Cahn and Mering's method, which, as I said before, is to a certain extent open to objection; but this is at present a matter of secondary importance for us, the chief thing being the fact that the constant results of the examinations of the above-mentioned authors prove the existence under certain conditions of free hydrochloric acid in cases of cancer of the stomach. The fact that in cases of cancer, when the contents of the stomach contain no hydrochloric acid, they do not digest on the addition of hydrochloric acid, or of small quantities of other stomach contents containing hydrochloric acid, must, as I showed long ago in answer to an experiment made on the subject by Riegel, be accounted for in this way: the HCl is taken up by the excess of albumen, and is thus prevented from acting. If Riegel had continued to add HCl until there was distinct evidence of free hydrochloric acid, the experiment would have had a positive result, there being as a rule no failure of pepsin. The other components of the gastric juice, pepsin and rennet ferment, do not keep pace with the failure of free hydrochloric acid. Peptone, the product of peptic action, is found almost without exception even when there is neither free hydrochloric nor lactic acid; pepsin must therefore have been secreted, and at one time there must have been enough free hydrochloric acid in the stomach for the formation of peptone. Most of the filtered contents of these stomachs digest and form not only propeptone but genuine peptone when acidulated with hydrochloric acid, until a proportion of two per thousand of free acid is present. Boas states (l.c.) that rennet ferment is found even when there is no free HCl. The explanation of this apparent paradox lies in the fact that the secreted hydrochloric acid is combined as long as there are present any free substances having affinity for it (bases, feeble salts, albumen and its derivatives), while the ferments remain free, and, as we know, continue to act till there is a large accumulation of the products of fermentation. It depends therefore essentially on the nature of the ingesta and the temporary energy of the secreting glands—the nature and extent of the lesion of the mucous membrane must of course be also considered—in what relation these three elements stand to each other, and in what proportion they are found to be present.

---

* L. Stiénon. Le suc gastrique et les phénomènes chimiques de la digestion dans les maladies de l'estomac. Journ. de méd. de Bruxelles, 5 Oct., 1888.

† Th. Rosenheim. Ueber atropische Processe an der Magenschleimhaut in ihrer Beziehung zum Carcinom und als selbständige Erkrankung. Berl. klin. Wochenschr. 1888, Nos. 51 and 52.

But, gentlemen, *it is substantially true that in most cases of carcinoma of the stomach there is no free hydrochloric acid.* The diagnostic value of this fact is unfortunately much diminished by the fact, which I have already mentioned, that other diseases also lead to failure of the hydrochloric acid reaction. But this gives still further proof of the correctness of my first statement, that *the proof of the existence of hydrochloric acid speaks strongly against the probability of the existence of cancer of the stomach*, for the cases of cancer of the stomach in which the reactions, if made with all due care, give positive results are so rare that they do not materially alter the case.

Under conditions favourable to their production (retention of the ingesta, introduction of easily fermenting substances), lactic and fatty acids and their salts will be found together with, or in place of, hydrochloric acid; they cause the acid reaction and burning taste and smell of the contents of the stomach, but a particularly interesting fact has now been repeatedly observed, not only in cases of cancer, but also in other affections of the stomach, that complete failure of the hydrochloric acid reaction is compensated for a long time by the intestinal digestion, or by the formation of large quantities of lactic acid (or at times, acetic acid).

2. A second part of the subject which calls for attention is *the presence of specific formed elements in the matter vomited or brought up through the tube.* Having already spoken in general terms of the composition of the matter brought up, I will merely recapitulate that in the advanced stages of the disease the utmost variety of fungi, saccharomycetes, sarcinæ, bacteria, flat and round epithelial cells with large nuclei, free nuclei and nucleated corpuscles are found together with large quantities of brown or blackish green detritus, and all sorts of remains of food—the only question remaining for us to discuss is whether we are in a position to recognise specific tumour elements. This, so far as it is a question of particular epithelial formations, is certainly not the case. Unfortunately, in spite of the care which has long been bestowed on the subject, we have no means of distinguishing specific cancer cells from epithelial cells which appear in

the contents of the stomach under ordinary conditions, some of which are derived from the wall of the stomach, while others are swallowed from the œsophagus and the oral cavity. Brinton says, "but mere isolated cells or nuclei scarcely justify a decision," and the cells with six and more concentric layers, which Lebert represents in his Physiologie Pathologique, and designates as specific cancer cells under the name of "globules cancéreux à parois concentriques," are nothing more than grains of starch. On this account, I consider conglomerations of cells formed in concentric layers, genuine cancer cell-nests, such as are here represented (fig. 16), to be the only positive proofs. In the case from which this preparation was made it was of decisive importance.

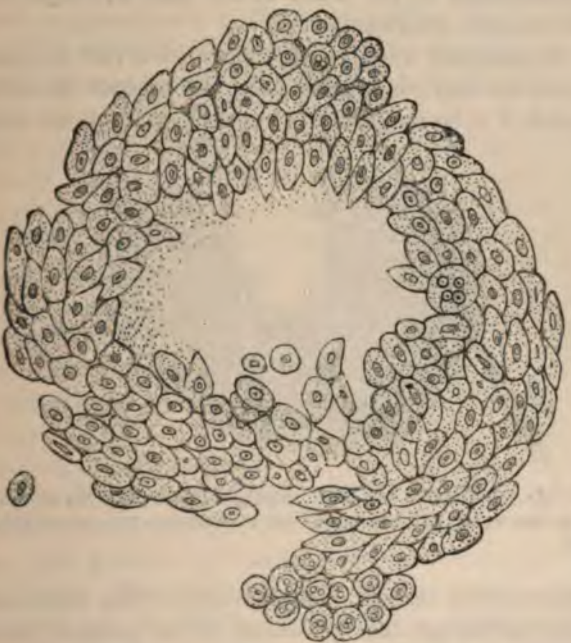


Fig. 16.—Mr. L. Carcinoma. December 11th, 1886. Drawn with the camera lucida.

The case in point was that of a gentleman, between thirty and forty years of age, without hereditary predisposition tumour, or cancerous cachexia, who for about six months had suffered from anorexia, pains in the region of the stomach, and frequent mucous vomiting. The stomach tube, whenever it was introduced, brought up large quantities of mucus, which contained no traces of hydrochloric acid. The diagnosis wavered between severe mucous catarrh and latent tumour. On a fresh examination being made, a few streaks of blood, containing a small, firm particle, were brought up, from which the above-mentioned preparation was made. The diagnosis was thus rendered certain, and was confirmed by the death of the patient, which occurred about two months afterwards.

But preparations such as this may give rise to mistakes. Small particles may come away from the mucous membrane of the stomach if it be unusually vulnerable, without the existence of a carcinomatous tumour. If a particle of this kind be placed under the microscope, the epithelium of the mucous membrane of the stomach, which surrounds the lumen of an excretory duct, may take a concentric stratification from the pressure of the cover glass, and thus acquire a great and most deceptive resemblance to a cancer-nest. The accompanying illustration (fig. 17) represents a shred of the epithelial covering of the stomach, and was found, together with a larger piece of the same kind, in the water with which the stomach of a patient, suffering from mucous catarrh, had been washed. The patient is twenty-eight years of age, has no symptoms of cancer, and is steadily improving in health. I shall be able to show you unmistakable representations of desquamated epithelial scales from the stomach, when I speak

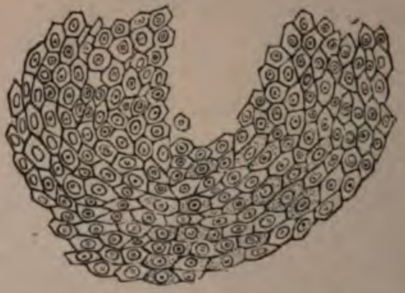


Fig. 17.—Mr. K. October 3rd, 1887. Epithelial flake from the stomach, found in the irrigation water, and bearing a false resemblance to a cancer-nest. Camera lucida.

later on the subject of catarrhal conditions of the gastric mucous membrane.

Rosenbach, in three cases of cancer of the stomach, found portions of the tumour in the irrigation water, which, when seen with the naked eye (there was, strange to say, no microscopic examination), are said to have been characterised by punctiform hæmorrhages penetrating their substance, and were distinguishable by means of the old brownish-black blood from pieces freshly torn from the mucous membrane.[*] Up to the present time I have had no opportunity of finding anything like them, and in spite of Rosenbach's expectations, I consider them to be rare, and their occurrence quite unconnected with the nature of the tumour.

3. *The cancerous tumour.*—With regard to the character of tumours of the stomach, and the peculiarities of their diagnosis, I will only mention in passing that tumours of the stomach, in order to be palpable, must obviously be situated at the greater curvature or at the pylorus, and that tumours of the lesser curvature, particularly when, as in the case represented in fig. 14, they grow superficially, and are covered by the lobes of the liver, are out of reach of any kind of manual recognition, and that a tumour of the lesser curvature can only be palpated when the stomach is in an abnormal position. It is equally evident that ascites, or carcinomatous peritonitis, renders the palpation of a tumour in the stomach impossible. It was long held to be an incontrovertible axiom that tumours of the stomach only change their position with respiration, when they have adhered to the liver. But this rule, too, is not without exceptions. Some time ago Fr. Müller demonstrated, before the Medical Society of the Charité Hospital in Berlin, a preparation of a stomach which had undergone complete carcinomatous degeneration, and which without any visible adhesion to the neighbouring organs, had, *intra vitam*, descended with every inspiration, the tumour being pressed down by the diaphragm. A similar descent of a tumour of the stomach may be caused by the liver, if the tumour lies close to, or has adhered to the lower border of the liver. In the case of an out-patient of ours, we have repeatedly

---

[*] O. Rosenbach. Ueber die Anwesenheit von Geschwulstpartikelchen in dem durch die Magenpumpe entleerten Mageninhalt bei Carcinoma ventriculi. Deutsche med. Wochenschr. 1882, No. 23.

and minutely examined a tumour of this kind, as large as my fist, which was situated at the greater curvature, close to the pylorus. This tumour could easily be moved by the hand, as well as by inflating the stomach, and descended most distinctly with every inspiration; but occurrences of this kind are exceptions which, according to the old saying, prove the rule. It is, however, important to call your attention to the fact that most tumours appear much larger when palpated than they really are, and that they may change their position according to the distension of the stomach or the intestines.

Thus it often happens that a tumour can only be palpated satisfactorily after inflating the stomach or intestine, and its situation, whether in the stomach or the neighbouring organs, accurately ascertained. It is sometimes very difficult, and even impossible, to distinguish a deformity which is found on the lower, and especially the left border of the liver, such as occurs in women from the use of stays, or a genuine tumour of the liver, the pancreas, or the spleen, from the stomach. But, on the other hand, a stomach which has undergone cancerous degeneration may be mistaken for part of the left lobe of the liver. Ott,[*] in a note to a case communicated in detail, says: "Total degeneration of the entire stomach as far up as the liver, rigid infiltration of the great curvature, with atrophy and contraction of the stomach, which rendered it possible to take hold of the greater curvature and caused it to feel like the border of the liver, led to this deception."

We meet with the same difficulty in the decision of the question whether a thickening found at the pylorus is to be attributed to hypertrophy of the muscular coat, or to cirrhosis, or to the ridge-shaped scar of an ulcer, or to foreign bodies encapsuled in the stomach,[†] to a circumscribed peritoneal effusion, or to carcinoma. Inflation of the intestines with air will sometimes prove that cancer of the omentum or of the intestinal loops, lying near the stomach, is not situated in the stomach itself; while, on the other hand, Leube is right in calling attention to the fact, that in cases of progressive emaciation the pancreas, which becomes more distinctly palpable through the relaxed abdominal walls, may assume the appearance of a growing tumour of the stomach. In such cases a long course of observation, the growth of the tumour, if it be one, the appearance of cancerous cachexia, the growth of metastases and swelling of the lymphatic glands, will alone be decisive, unless, indeed, under certain conditions, these symptoms fail, and a *post-mortem* examination first reveals the true state of the case. In all these cases the examination of the contents of the stomach is of great importance. Should the usual quantities of free hydrochloric acid be found after the test breakfast, we can say with tolerable certainty that the stomach is not affected. The cases quoted in detail above will, however, show you that this is not invariably the case. To illustrate the other side of the question, I will relate two cases in which the discovery of hydrochloric acid rendered the diagnosis certain and beyond all possibility of doubt.

---

[*] Ott. Zur Pathologie der Magencarcinome. Zürich, 1867, p. 60.

[†] These foreign bodies are generally hairs which have been swallowed, and which, taking an oval or spherical shape, assume the deceptive appearance of a malignant tumour. But a shellac stone, in the case of a carpenter who had drunk his polish for brandy, and similar foreign bodies, have caused mistakes; see, for instance, Palemon Best, Death from accumulation of hair in the stomach of a woman, Brit. Med. Journ. 1869, Dec. 11, and other English authors. Englishwomen seem to be particularly fond of swallowing hair, but if I am not mistaken a similar case is published by Schönborn.

On the 24th of November my colleague X. sent Mrs. W. to me, a small, emaciated, delicate-looking person, thirty-three years of age, the mother of four children. She complained of violent pains in the pit of the stomach, which continued night and day with only short pauses. These pains were independent of food, had continued for more than six months, and were lessened for a time by the use of Carlsbad waters. The patient suffered much from eructation, but had a good appetite and did not vomit.

The tongue was not foul; the abdomen was somewhat pendulous and the abdominal walls relaxed. Close to the median line, and to the right of it, was a tumour the size of a walnut, painful on pressure and easily movable, and outside, and again to the right, was another smaller tumour, which descended with respiration (gall-bladder). Inflation of the stomach with air showed dilatation and descent of the greater curvature to an equal distance between the symphysis and umbilicus. The contents of the stomach contained large quantities of free hydrochloric acid, no elements of fermentation or decomposition. On further inquiry it appears that the patient had already suffered at times from gastralgia. Diagnosis: dilatation of the stomach in consequence of cicatricial stricture of the pylorus, and hypertrophy of the muscular coat in consequence of a pyloric ulcer. Proof: continued improvement and increase in strength after methodical washing and appropriate diet. Complete absence of cancerous cachexia.

In this case the diagnosis is only rendered certain by the result of the examination of the stomach, but that is sufficient. It is well known that hypertrophy of the muscular coat of the pyloric region may assume the appearance of a newly-formed tumour, and one case of this kind has been described by Virchow,* and another, a short time ago, by me.†

The following is the second case to which I referred above: H. S., teacher from Salzwedel, fifty-six years of age. He was a very large and powerfully built man, but extremely emaciated, and had a cachectic appearance. The abdominal walls were relaxed and flabby, as in the case of a woman who has had many children. A wide, slightly uneven, flat tumour, extending to the axillary line on the right, and to the parasternal line on the left, could be felt in the umbilical region, lying close to the abdominal walls. On deep inspiration a pseudo-movement was felt, that is to say, the displacement of the abdominal walls bore a resemblance to the movement of the tumour. The patient was highly dyspeptic, suffered from extreme eructation, and had vomited several times. There could be no doubt that this was a case of carcinoma of the omentum; the only question was whether there was at the same time a carcinoma of the stomach, to which the dyspeptic difficulties seemed to point. Examination of the stomach contents showed large quantities of free hydrochloric acid, an acidity of fifty, and good digestive activity of the filtered stomach contents. Implication of the stomach was, therefore, excluded. The autopsy which followed shortly after proved the correctness of our supposition.

In the case of larger tumours, percussion may show a circumscribed area of dulness, but I need not insist upon the fact that the phenomena may vary much, according to the amount of air contained in the intestines and in the stomach, and according to the strength of the percussion. Fine differences of sound are best distinguished by percussing gently with the finger, and listening at the same time directly or by auscultation. Under certain conditions, axial rotation of the stomach may cause small tumours to disappear completely, and be recognised neither by palpation nor percussion, but when the stomach or the intestines are inflated with air they again become recognisable.

---

* Virchow. Wien. med. Wochenschr. 1857, No. 26.

† Ewald. Berl. klin. Wochenschr. 1886, No. 32.

Under certain conditions a distinct pulsation of the tumour is felt, which then lies upon the aorta, and is raised by it. We may avoid the latter source of fallacy, in which the pulsation is frequently astonishingly strong and apparently lies close under the depressed abdominal walls, by remembering that a tumour pulsates only in a vertical direction, the aorta vertically and transversely, but this is not always decisive. When the tumour grows round the aorta, as in a case mentioned by Ott,* all the signs of an aneurism of the aorta may exist: transverse and vertical pulsation, systolic murmurs, and distinct vibration over the tumour, smallness of the femoral pulse, even bulging in the dorsal region, and similar phenomena make their appearance when a calcareous, ring-shaped constricting infiltration has developed in the wall of the aorta, which leads to a dilatation above the contracted part. In such cases differential diagnosis is out of the question.

The confusion between a tumour and hard fæcal masses, which when situated in the transverse colon or the jejunum may assume the appearance of a growth, and the rule that in all doubtful cases the examination must be preceded by a thorough evacuation of the bowels, are so well known that I hardly like to mention them. But practice has convinced me that this is a point often neglected, although no text-book omits to mention it.

In many cases there are constant pains in the tumour, the varying character of which has been already discussed in treating of the general symptomatology. In others they vary in intensity, sometimes ceasing entirely, or asserting themselves only by an indefinite burning or feeling of oppression in the epigastrium. The exacerbations of pain are then usually caused by fresh inflammatory processes, or by the development of new tumours, or by distention of the walls of the stomach by gas, or by firm adhesions to neighbouring movable organs. If the pain should take a downward course towards the umbilical region and hypogastrium, in all probability the tumour has infected the peritoneum, in which case distinct friction sounds may be audible, particularly in the region of the liver, and under certain conditions friction may even be felt.

---

* Ott, l.c. p. 73.

4. *Cancerous Cachexia.*—The peculiar condition of patients suffering from cancer, which we designate as *cachexia carcinomatosa*, appears, almost without exception, sooner or later during the course of the disease, and has furnished various authors with an opportunity for making more or less poetical descriptions. Cancerous cachexia may, unfortunately, lead to mistakes, both of a positive and negative nature. Of the latter, because it is often absent during the preliminary and intermediate stages of the disease, at a time when it would be of the utmost importance to us in giving certainty to a doubtful diagnosis. I have already brought under your notice the case of a patient who had suffered for months from an undoubted carcinoma of the pylorus, yet his appearance led no one to guess his serious disease.

A few weeks ago I was called in to another patient, suffering from a very large nodular tumour, which took up the whole of the epigastrium, and, adhering to the liver, was so prominent as to be most distinctly felt. It was stated that the patient had only been ill a fortnight; that he had up to that time attended to his professional duties; that he had made no change in his social habits; and that neither his family nor his friends had been struck by any particular change in his appearance, till, quite suddenly, jaundice and œdema of the lower extremities had set in. Even when I saw the patient there was no question of cancerous cachexia proper, and yet there can be no doubt that the neoplasm had existed for a long time.

On the other hand, it is not unusual to find individuals with typical cancerous cachexia, whose history and symptoms cause grave suspicions of carcinoma, but who, after a time, if properly treated, completely regain their strength, and thus give the most convincing proofs to the contrary. It is hardly necessary to mention that if we except manifest diseases of a recognisable nature, the contingent is chiefly made up of the different forms of hysteria. Every practitioner knows how weak and emaciated a hysterical person may become. In the case of young people, especially young women, there is no great difficulty connected with the recognition of these conditions. Leaving the other characteristic phenomena out of the question, the elasticity of the skin, which, in contradistinction to cancerous cachexia, is well preserved in hysterical cachexia, is a valuable distinguishing mark. The diagnosis is more difficult in male hysteria.

Some time ago, in conjunction with a colleague from this city, I treated a man, 40 years of age, who, during the course of two months, had lost thirty pounds in weight, and showed a very considerable though not extreme cachexia, with a series of symptoms, chief among which was complete anorexia, combined with extreme *fœtor ex ore* and feeling of oppression in the gastric region, which caused us to fear a severe and rapidly-developing organic disease. In addition to this were palpitations of the heart and attacks of dyspnœa, said to be of a very violent nature, and connected with peculiar sensations, particularly a most painful and distressing feeling as if the legs had become numb and were icy cold. A most unfavourable prognosis had been made by other physicians, and the patient, whose spirits were easily affected, felt in consequence much depressed. He had lain in bed for weeks, and maintained that it was impossible for him to get up. The latter phenomena, palpitation of the heart, dyspnœa, peculiar sensations, for which (after a slight posterior dulness, at the right base, had been proved to be a temporary atelectasis) no reason could be found, either in the organs of circulation or of respiration, led us to regard it as a hysterical condition, complicated and perhaps indirectly caused by gastric catarrh, and to adopt a course of treatment in accordance with this view. The result showed that we were right. The symptoms yielded completely to the use of hydrochloric acid and moderate doses of bromide of potassium, together with washing out the stomach with solution of thymol, and at the end of a month the patient was practically cured.

In the case just described the age of the patient (forty years) was strongly against cancer. But with regard to this point too the most curious mistakes may occur.

On June 19th, 1886, a colleague brought his mother to me, a lady rather more than fifty years of age, whose extreme emaciation and weakness, earthy coloured complexion and dry skin, led me at first sight to suppose her to be suffering from cancerous cachexia, as she complained of violent pains in the stomach, especially after eating, which did not cease until she had brought up wind several times. She had in consequence lived for nine months on a most strict and meagre diet, and was, as I have already said, much reduced in strength. On closer inspection, or rather after waiting a little, it appeared that her condition was entirely caused by hysteria. While the physical and chemical examination showed completely normal conditions, and the action of the bowels was, as I discovered later, also normal, I had during the first examination an opportunity of observing an attack of flatulence such as had been described to me. The quickest possible succession of hiccoughs, which lasted nearly half a minute, drove out the air and made a noise almost like thunder, but did not appear to distend the body to any great extent. This was several times repeated at short intervals, so that the whole gave the impression of a quickly passing storm. The diagnosis of hysteria had of course been made long ago by other physicians, and the whole set of nervine remedies made use of. I called to mind a similar case which I had long watched in Frerichs' ward, in which a hysterical spasm of the glottis was promptly stopped when the electrodes were placed upon the cervical vagus and the induced current allowed to pass. Here, too, the same treatment produced the desired result, the attack ceasing at once. But in order to bring about not only a temporary cessation of the attacks, but also if possible to work a permanent cure, I determined to wash out the stomach of the patient methodically, hoping that by means of mechanical irritation and the sudden shock to the gastric mucous membrane, the hyperæsthesia of the organ would be blunted. I must leave you to judge whether my supposition was correct, or whether this was an instance of hysterical caprice which so often helps to produce good results from treatment which is apparently most extraordinary. The fact is that the washings were so successful that after they had been five times repeated the troublesome symptoms completely disappeared, and as I heard on inquiry, did not return.

This is sufficient to prove the already well-known fact that the cancerous cachexia, as an individual symptom, looked at by itself, is not one to be trusted.

It remains for us to discuss the *differential diagnosis* so far as it has not been already dealt with in the preceding pages.

The following processes are chief among those which have to be considered with regard to this question: Ulcus ventriculi, catarrhus gastricus gravis, atrophy, amyloid degeneration of the gastric mucous membrane, and serious hysterical and neurasthenic conditions. I must begin by remarking that under certain conditions it is impossible to make a certain diagnosis, and to reject absolutely any of the above-mentioned processes; the true state of the case is first ascertained by means of an autopsy. In other cases there are phases of more or less length occurring in the course of the disease during which there are no certain indications by which a diagnosis can be made.

The absence or the presence of free hydrochloric acid in the stomach contents gives us indeed a degree of certainty unattainable a few years ago, but the foregoing remarks suffice to prove that this certainty is not absolute. Hydrochloric acid is absent not only in carcinoma, but also permanently in cases of severe chronic gastric catarrh and atrophy of the gastric mucous membrane, and may fail for a length of time in hysteria and even in neurasthenia. There are, on the other hand, undoubted, though rare cases of carcinoma in which there is no failure of hydrochloric acid, and although ulcer of the stomach is usually combined with abnormal acidity, yet cases are recorded in which the secretion of hydrochloric acid was only slight. These comparative statements will show you once more the value of the estimation of hydrochloric acid. You will agree with me that although it does not provide us, as enthusiasts at first hoped, with a philosopher's stone to explain everything, yet it is of the utmost importance as an aid to diagnosis.

But after all the most important and decisive point in the diagnosis of carcinoma is the proof of the existence of a tumour. On this point it is only necessary to guard against confusion with tumours situated outside the stomach, or with hypertrophic, tumour-like thickenings of the pylorus, gastroliths and similar processes, for the recognition of which I must refer you to what has been already said on page 406, *et seq.* If there be no proof of the existence of a gastric tumour, it is difficult, and as I said before, under some circumstances impossible, to make a definite diagnosis. Atrophy of the gastric mucous membrane, which may imitate exactly the symptoms of a slow and creeping carcinoma, is one of the conditions which render a definite diagnosis impossible, because it not only produces permanent absence of hydrochloric acid, but also of the rennet ferment. The absence of cancerous cachexia is however important, as in atrophy of the gastric mucous membrane it is less marked than in carcinoma. A considerable number of cases are recorded in literature, in which widespread cancerous degeneration has run its course, unaccompanied by special symptoms. A case is mentioned by Storer* in which almost the entire stomach had undergone a colloid degeneration, without leading to serious digestive disturbances or vomiting. Siewecke † too has collected twelve cases of a similar nature, in all of which there was absence of the typical symptoms of cancerous disease.

A short time ago I examined the body of a man, twenty-nine years of age, who, up to within a month of his death, had undergone a course of Playfair's massage cure, because he was supposed to be a neurasthenic, without any disturbance of digestion having shown itself. At this time a tumour in the abdomen is said to have first become palpable, a hæmorrhagic pleurisy appeared and the patient died shortly afterwards in a state of coma. There was found to be general widespread invasion of cancer. The stomach was imbedded in nodular tumour masses, its walls thickened to double their normal size, and its diameter somewhat corresponding with that of a medium-sized transverse colon. The mucosa, under the microscope, was almost entirely infiltrated with cancerous new growth (fibro-sarcoma), the long and narrow gland ducts being only preserved in the smaller part of it, but the epithelium of the mucosa was markedly granular and cloudy, and the outlines of the cells were obscured. It was evident that for a long time there could have been no question of gastric digestion, but the ingesta must have passed through the stomach, as if it were a continuation of the œsophagus, and entered the bowel, which up to within a short time of the patient's death bore the very considerable burden of digestion laid upon it. This case may therefore be added to those mentioned above, in which nutrition was maintained in spite of the failure of gastric digestion, the whole work of digestion being undertaken by the bowel.

In this category, too, the cases must be classed in which the disease continues latent for a long time, or is accompanied only by indefinite dyspeptic symptoms, and then, all at once, in connection with, or apparently in consequence of, a serious disturbance of assimilation, mental trouble, any great alteration in the manner of life, for instance a "Schweninger-cure," or an exhausting course of hydropathic treatment, there is a rapid development of all the symptoms of cancer. The patient then fancies that he has discovered the cause of his disease, while in reality the change in assimilation has merely lessened the power of the tissues to oppose the new growth, or in other words, favoured the growth of carcinoma.

---

* Storer. Colloid disease of the entire stomach without any symptoms. Boston Med. and Surg. Journ. 1872, Oct. 10.

† Siewecke. Ueber Magenkrebs. Inaug.-Dissert. Berlin, 1868.

The differential diagnosis between ulcer and cancer will be discussed under the former heading, and I will now merely call attention to the fact that hydrochloric acid and ferments (pepsin and rennet ferment) are always present in the first-mentioned disease, and are wanting in the very great majority of cases of the latter. Experience has proved that the existence of ulcer is no protection against the development of carcinoma, but it seems that ulcer never appears in cases in which cancer is already developed. For the rest, the observance of the following points will help to make a correct diagnosis:—

1. In cases of carcinoma the *appetite* is, as a rule, seriously and permanently affected. In ulcer of the stomach, it fails only during the attacks of pain, and returns when there is remission or intermission, although the patient, fearing to produce a new attack of pain, endeavours to suppress it, or at least to satisfy it as little as possible. The condition of the tongue is, as I mentioned before, highly characteristic. In ulcer of the stomach it is usually clean, or foul only at the roots, while in the majority of cases of cancer it is covered with a white fur.

2. In ulcer the *pain* is more distinctly local, confining itself usually to the region of the scorbiculus cordis and the left parasternal line. It is remarkable that in ulcer the pain frequently shoots towards the back as so-called lumbago, corresponding to the position of the ulcer, which in forty-three per cent. of all cases is situated on the posterior wall of the stomach. In ulcer, too, the pain is generally influenced, that is to say, produced by external causes, by taking food, by pressure from without, by certain movements and positions of the body, and sometimes by the mere movements of respiration. In carcinoma

it is as a rule more constant, but at the same time less intense and not amounting to paroxysms, but cases of carcinoma are subject to manifold changes.

3. *Vomiting.*—In ulcer, vomiting is unmistakably connected with pain, both being irregular and inconstant. Vomiting appears at an early stage of the disease, while in cancer it is usually absent during the first few months, but increases in frequency later on. Ott remarks very justly, that in carcinoma vomiting is dependent on the position of the tumour; in ulcer, on the duration and intensity of the pain. The organised elements which may be found in the matter vomited, as well as the admixture of blood in the vomit, or hæmatemesis proper, have been already discussed under the heading of general symptomatology. I must add that hæmorrhage is relatively and absolutely more frequent in ulcer than in cancer, and the intensity of the hæmorrhage is also greater; but on the other hand there are in ulcer longer pauses between the single attacks of hæmorrhage, or a relatively short series of attacks, while in carcinoma, when hæmorrhage once appears it is either constant or much more frequent in its recurrence. If you should be called in to a patient suffering from extreme hæmatemesis and hæmorrhage *ex ano*, which symptoms have appeared suddenly and rendered him so anæmic that there is danger of a sudden collapse *ex anæmiâ*, you may be pretty sure that you are right in making the diagnosis of ulcer.

The so-called essential and idiopathic anæmia has perhaps given rise to confusion with carcinoma, or, on the other hand, to non-recognition of that disease, perhaps less often in Germany than in other countries. At least I find several cases noted in English literature, in which a careful examination of the blood and of the stomach contents would have prevented the occurrence of this mistake.

Finally, the differential diagnosis between cancer and extreme forms of hysteria must be considered. At first sight it seems hardly possible to mistake these conditions for each other, yet cases sometimes come before us in which the diagnosis cannot be made at all *ex tempore*, and even a long course of observation does not enable us to make it with absolute certainty. I will not at all vouch for the case, but still it has happened, not once but repeatedly, that hysterical women have gone on swallowing their hair for years, and that the hair has formed into a ball in the stomach which might be mistaken for a tumour.* But without this complication, severe hysterical attacks may lead to extreme disturbances of nutrition, which, especially in the case of older women, give rise to a suspicion of cancer. But as a rule one or more characteristic symptoms will show themselves, which enable the diagnosis to be made with certainty.

TREATMENT.

The old saying that no herb that grows will cure cancer still holds good, however much we may regret the fact. All the specific remedies which have started up in the course of time, from the cicuta and belladonna of Vogel, Störck, and Hufeland, to the condurango bark of Friedreich of Heidelberg, have owed their ephemeral reputation to conscious or unconscious deception. At best, like condurango bark, they have a favourable effect on the symptoms in mitigating the accompanying catarrh, and stimulating the digestive activity of the organ, but a curative effect in the proper sense of the words is out of their power. The fame of condurango bark, recommended by Friedreich in the year 1874, was founded on a case which we will designate as one in which an autopsy was not made (!), in which, after it had long been used, a carcinomatous swelling was said to have shrunk to a small tumour, and the swollen lymphatic glands to have entirely disappeared. Like so many of our modern remedies, it owes its reputation as a specific to the implicit faith of some half or wholly savage Indian tribe, and to the speculative tendencies of enterprising exporters. The medical world, which displays an astonishing naïveté and incurable optimism with regard to any new specific remdy for incurable diseases, at first hailed it with acclamations, and made use of it indiscriminately in all cases of cancer, but a speedy disillusion following this enthusiasm it was cast aside, and was in danger of being forgotten. One is as bad as the other. For a long time praise and blame were dealt out, neither of which rested on the foundation of a methodically conducted series of experiments. This was first undertaken by Immermann on a small scale, then carried out on the same plan and on a larger scale by Riess, who has lately published the results of his experiments.* Immermann's cases, which are not exclusively confined to carcinoma of the stomach proper, show a comparative percentage of deaths of 1 (with condurango) to 1·3 (without). Riess considers that the remedy should be confined to cancer of the stomach, but after having made observations in eighty cases with condurango, and one hundred and sixteen without it, he declares in favour of its specific effects. A long-continued course of it gives satisfaction to the patient, is said to lead to disappearance of the growths, and to have a favourable effect on the general symptoms, thus inducing a subjective and objective improvement in health. "After watching a large number of cases, an unprejudiced observer would be decidedly of opinion that life was sometimes considerably prolonged by a course of treatment with condurango." The following statistics have been compiled with regard to the mortality and the duration of treatment :—

---

* Russel. A case in which the cavity of the stomach was occupied by an enormous mass of human hair. Med. Times and Gazette, June 26, 1869.

	Average duration of treatment in all cases.	Died.	Average duration of treatment.	Dismissed.	Average duration of treatment.
Cases with condurango, 80...	43·4	53=66·3°/₀	39·5	27=33·7°/₀	54·8
Cases without condurango, 116	21·2	107=92·2°/₀	22·0	9=7·8°/₀	11·7

It is noticeable that here too the proportional percentage of deaths with and without condurango amounts to 1 : 1·4 (Immermann gives a percentage of 1 : 1·3), the two authors thus arriving at nearly the same conclusion. This would be most conclusive if the diagnosis of carcinoma of the stomach had been made with certainty in each case, and if the cases dismissed had afterwards been watched for a length of time. But these precautions were not taken, and Riess speaks in a guarded manner of "the complex of symptoms of cancer of the stomach," thus casting a doubt on the accuracy of his results. He has unfortunately omitted to state the position of the carcinomatous tumour, and to confirm the diagnosis by means of the new methods of investigation in the cases observed by him. Neither is it stated whether the clinical diagnosis was verified in every case by a *post-mortem* examination. This is the more to be regretted, because in three cases in which carcinoma was stated to have been cured or ameliorated, an autopsy made on account of another fatal disease did not entirely confirm the diagnosis made *intra vitam*, for according to the short account of the autopsy of these three cases given by Riess, it seems most likely, not to say certain, that old cicatrised ulcers were present.

---

* L. Riess. Ueber den Werth der Condurangorinde bei dem Symptombilde des Magencarcinoms. Berl. klin. Wochenschr. 1887, No. 10.

For these reasons I do not trust to the statements which have been published with regard to the specific effect of condurango. It may be objected that the disappearance of tumours, which, as Riess states, might even be measured with a half-inch measure, is a point of the utmost importance. But it must not be forgotten that an improvement of the concomitant mucous catarrh may cause a diminution of hyperæmia, and at the same time atrophy of the tumour. It is a well-known fact, of which I have already reminded you, that tumours in the abdominal cavity appear much larger than they really are, when felt through the abdominal walls, which proves that the swelling or atrophy of these tumours would also appear in an exaggerated form. How often have we not fancied a swelling felt at the pylorus, to be as large as a walnut, or even as a hen's egg, which a *post-mortem* examination has showed to be a slight muscular hypertrophy of the *cervix pylori*.[*]

But these remarks are not intended to dispute the good effects of condurango on the general symptoms of cancer of the stomach, which I have repeatedly observed. The observations made by Riess are in this respect most important, and his recommendation to give large quantities of the remedy should be followed; but let no man suppose that carcinoma of the stomach can be cured by it, in spite of all that Orszewcky and Erichsen may say to the contrary.[†] The concomitant gastric catarrh is mitigated, and this favourable effect is produced even when there are genuine mucous catarrhal diseases of the gastric mucous membrane, so that condurango is an excellent stomachic in all cases in which there is a genuine catarrh of the mucous membrane, that is to say, a secretion of sero-mucous fluid containing larger or smaller quantities of pus. Condurango is best given in decoction of 25 to 200 to be taken in two days, and on account of the diminished secretion of hydrochloric acid which always takes place in such cases, about 0·3 or 0·5 per cent. acid muriatic, P.B., and a carminative syrup, syr. zingiberis or syr. fœniculi or menthæ should be added. Immermann has given a prescription for condurango wine. The vinous extract makes the medicine more expensive, without, as far as we can at present tell, extracting any special ingredients from the bark. On this account I prescribe, in cases of necessity, the decoction with water and good wine to be drunk separately.

---

[*] I have adopted Retzius's name for that portion of the pyloric ring which doubles into the duodenum like the cervix uteri into the vagina. Bemerkung ueber das Antrum pylori beim Menschen. Müller's Archiv, 1857.

[†] Zur Casuistik der Condurangowirkung bei Carcinom. Petersburg med. Wochenschr. 1876, Nos. 2 and 3. Orszewcky and Erichsen believe that they have observed stimulation of the growth of the connective tissue, together with simultaneous destruction of the cellular elements of the cancer.

But after all, the treatment must be confined to the symptoms. Vomiting disappears, or is mitigated by the internal use of ice pills, with a few drops of chloroform, or ice-cold carbonic acid water, taken in a teaspoon, or effervescing lemonade or champagne (one of my patients asked for pale ale as a remedy for vomiting, and found that it agreed with him), or by the use of morphia, either as an injection or taken internally. Sometimes the daily use of opium suppositories, each containing 10 to 15 mgrm. is temporarily beneficial.

The beneficial effect of perchloride of iron, formerly so strongly recommended as a remedy for hæmatemesis, is very doubtful and not easily to be accounted for, when taken in such a solution as the stomach can assimilate without fear of causing corrosive poisoning. Nature has provided for the stoppage of hæmorrhage from small vessels by the formation of thrombi. Hæmorrhage from larger vessels will not be affected by dilute perchloride of iron. A good effect is far more likely to be produced by the contracting effect of cold on the vessels (internal use of ice, ice-cold compresses on the body) and by ergot.

I prescribe the extractum secalis cornuti bis purificatum (ergotin), with equal parts of glycerine and water in 50 per cent. solution, to be injected into the epigastrium two or three times every half hour, and ten to twenty drops to be taken every hour, as sclerotinic acid is not calculated to have a poisonous effect on human beings if taken in quantities of less than ten grammes. In the present state of uncertainty with regard to the effect of sclerotinic acid, the use of extract of ergot is more to be recommended. The effect of this extract must not be judged by the result of its application as a remedy for hæmatemesis in cases of cancer, in which the coats of the vessels are degenerated and infiltrated with more or less rigid masses of growth. When used for hæmorrhage in cases of ulcer (see ulcer) a far more favourable effect is obtained.

Frictions with chloroform liniment, hydropathic applications, with infusions of chamomile, warm poultices, douches, and remedies of a like nature, may be tried as mild anodynes, but they very soon lose their effect, and we are obliged to have recourse to narcotics, either taken internally, or subcutaneously, or by suppository. I have not found the effect of cocaine to be good in cases of cancer; chloral is preferable, but its hypnotic qualities preponderate too strongly over its sedative qualities. Preparations of opium have this great disadvantage, that they serve to retard the already sluggish action of the bowels. This applies chiefly to opium, morphia or codeine, as is well known, having far less effect on the evacuations of the bowel. But individual differences here come into play, so that in some cases small doses of morphia, varying from five to ten mgrm., may, if taken for several days together, cause inveterate constipation. Belladonna has long, and rightly, been considered an antidote to this effect of opium, but, as a rule, it is given in much too small doses. From twenty to fifty mgrm. of extract of belladonna may be added to ten mgrm. of morphia, and subcutaneous injections should contain a tenth part of sulphate of atropia, made fresh. But as the effects of belladonna are very different in different individuals, and in some cases dilatation of the pupils, dryness of the tongue, and irritation of the throat, result from very small doses, the patient's attention must be called beforehand to the probable effects of the medicine. One gentleman, suffering from carcinoma of the colon, and metastases in the liver and retroperitoneal glands, declined to take the pills prescribed for him on reading the prescription and seeing that extract of belladonna was one of the ingredients, as "he should immediately have an attack of dysphagia and troublesome dryness in the pharnyx." We thought this was, to say the least of it, a great exaggeration.

and gave him 0·1 extract of belladonna in a suppository, without his knowledge. The next day he complained of the specific effects of belladonna in the suppository, and reproached us for having deceived him.

Mild vegetable aperients should be used as long as possible for the relief of constipation. Neutral salts are to be avoided, because they weaken the patient unnecessarily by the loss of water, and are likely to lead to diarrhœa. In severe cases, cathartic pills, such as I have recommended in cases of dilatation of the stomach, should be made use of. Enemata, too, either of tepid water alone, or with the addition of aperients, injections of glycerine, which may be increased to between thirty and fifty grms., and glycerine suppositories are recommended for retention of the fæces in the colon; but these remedies all fail as soon as there is a general paresis of the intestines, and accumulation of intestinal contents in the small intestines. Some forms of diarrhœa may be treated by the use of opium, either in the form of enemata or suppositories. I do not consider it advisable in such cases to make use of ordinary astringents, such as calumba, logwood, catechu, nitrate of silver, tannin, &c., because the loose motions are caused by such serious anatomical lesions that mild astringents and anticatarrhal remedies are completely useless. I have, in speaking of dilatation of the stomach, already discussed the treatment of conditions resulting from stricture of the pylorus, that is to say, the phenomena of congestion and decomposition of the stomach contents.

The food should consist chiefly of vegetable and starchy matter, because the diminished secretion of hydrochloric acid causes a defective digestion of albumen and of meat. For this reason milk disagrees with the patient in the generality of cases, and the addition of soda or lime-water is no improvement, because there is a failure of rennet ferment, the formation of which is, under normal conditions, promoted by these means. A few drops of cognac added to a tablespoonful of milk has a better effect. In many cases kefir or Voltmer's peptonised milk is readily taken. Other artificially-digested preparations, particularly meat peptone, taken as broth or mixed with soup or gravy, are here in their right place. It is unfortunate that even the most palatable of them (Kemmerich's and Koch's meat peptone and Leube's solution of meat) quickly become distasteful to the patient, and according to my experience meat-peptone-chocolate and peptone-beer are the only preparations which can be taken with pleasure for any length of time. Gruel made with leguminous flour, Nestlé's flour, and such-like preparations, which are otherwise highly to be recommended, all labour under the same disadvantage. The food must be cut up as finely as possible, or taken in a pultaceous form.

For many patients it becomes a veritable torment of Tantalus to be obliged to live for any length of time upon a diet of pap or very finely minced food. The organs of mastication and the salivary glands have an irresistible craving for work, and the palate longs for a good appetising morsel. When this happens, as it usually does when the disease has about half run its course, extreme anorexia generally appearing during the later stages, it is excusable to relax the severity of the rule for a short time, and to let the patient eat what he likes, unless it should be something manifestly injurious. In many cases the patient derives his chief enjoyment in life from the pleasures of the table, and a concession of this kind will provide him with the last gratification which he is capable of enjoying.

But there is a certain class of so-called indigestible food, that is to say, food in which the nutritive material is enclosed in a covering not sufficiently softened by the process of preparation, or is permeated with tough fibres which long resist the action of the digestive juice, or contains matter with which the digestion is altogether incapable of dealing, which should be avoided under all circumstances. Here, too, belong fermented drinks containing a large quantity of fermentible substances, and fats which decompose and cause trouble after having lain long in the stomach.

There is a second class of aliments which is not, indeed, forbidden, but which agrees very differently with different patients. In such cases the personal feelings of the patient are the best rule of action. But it may happen where there are two doctors that the one forbids what the other allows, and the patient does not know which to believe. No detailed bill of fare should be drawn up without a previous consultation with the colleague in question, and Trousseau's example should be followed, who refers the patient to his own experience for what he can take. All this refers only to the first stages, in which the so-called dyspeptic phenomena are the most prominent symptoms of the disease.

Later on the choice of food becomes more and more limited, and is, at last, confined to gruel of different kinds (flour, rice, sago, tapioca, &c.), with the addition of peptone, finely-chopped white meat, blancmange of rice or Indian corn, calves' foot jelly, eggs, if they can be taken, bouillon, which, however, is usually refused at an early stage, and such-like food. The strength must be kept up by means of strengthening remedies, strong tea, good French claret, dessert wines, with the exception of port, which is too sweet, and at times champagne.

No good results can, of course, be expected from hydropathic treatment, or the use of mineral waters at home, when the diagnosis has once been made with certainty. But as the disease may be, and frequently is, mistaken during its earlier stages, and the patient, under the diagnosis of "chronic gastric catarrh," &c., visits the celebrated thermal springs of Carlsbad, Marienbad, Ems, or Vichy, either *suo sponte* or *medico consiliante*, we often hear reproaches made against "the doctor who sent me to the wrong watering-place." This will, in future, be partially prevented by a thorough appreciation of chemical diagnosis, which enables us at a very early stage to suspect cancer, and teaches us to act accordingly. Many patients who have no idea of their condition are most anxious to try a course of water treatment. "Then," says Lebert, "I cautiously prescribe small quantities of the mineral water in question to be taken at home, and as they usually experience no subsequent benefit, they soon give up the idea of going to a watering-place."

LECTURE VI.

ULCER OF THE STOMACH—ULCUS PEPTICUM SEU RODENS.

GENTLEMEN,—The preparation which I now submit to your notice came from the following in many ways remarkable case.

The patient was a married man, thirty-five years of age, the father of two healthy children, an architect, who had latterly gone through much trouble and anxiety with regard to his profession. He was, in spite of his youth, inclined to be stout, was somewhat of a gourmand, and drank large quantities of Bavarian beer. He had never suffered from syphilis, and had always had good health. During the last year he had complained of pains in the body, which were said to be sometimes situated in the right side, but as a rule were not confined to one part. He was at times nervous and excitable, and suffered from insomnia. His loss of weight, which continued in spite of good care, and which during the last year amounted to eighty lbs., caused him much anxiety. He had decreased in weight from 186 to 106 lbs. His family thought that the "abdominal pains" from which he occasionally suffered might be traced to various errors of diet.

The patient was examined by me together with my colleague, Dr. G., and we failed to discover any objective abnormality either of the internal organs or of the nervous system, with the exception of a slight feeling of pain on deep pressure in the scorbiculus cordis, such as always accompanies gastric catarrh. The appetite was good, the tongue clean, the action of the bowels irregular, but easily regulated by means of mild aperients. There was frequent flatulence. The general symptoms were weakness, exhaustion, and utter distaste for work. The urine was free from abnormal constituents.

In view of the serious decrease in weight we could not be contented to diagnose a simple catarrh of the digestive tract, as had been done by other physicians, but resolved to put the patient for the present upon very strict diet and to observe him carefully. He was therefore admitted into hospital and put upon nourishing, but not too copious diet. During the first few days he took infus. rhei with immediate results. The examination of the matter brought up after the test breakfast showed a normal amount of hydrochloric acid, peptone, and achroodextrine, but no sugar. He felt quite well, only complaining occasionally of insomnia and pains in the limbs, which were easily accounted for by the unusual confinement to one room, and the fact that he was only allowed to get up for two hours during the day. But in spite of this he continued to decrease in weight, and lost half a pound during the first week, and three-quarters during the second. On the sixteenth day he was most anxious to go out, to attend to some matter of business, which he accordingly did in the morning, accompanied by his wife, who most certainly did not allow him to commit any dietary indiscretions. In the afternoon he suddenly became very restless, kept on ringing the bell for some trifle, and without any previous feeling of nausea, suddenly vomited about a litre of fresh, bright red blood, mixed with a little mucus. He was immediately put under the appropriate treatment (ergot and morphia, with internal and external applications of ice, see below), and passed the night without a second attack. The next morning there were two attacks of hæmatemesis, preceded by restlessness and excitement, and in the course of the day seven bloody evacuations of the bowels; at first hard dark brown matter, then tar-like evacuations, and at last almost unmixed blood. The patient was extremely anæmic, so that the idea of transfusion was contemplated, but his pulse rose again, he passed a good night, and feeling better in consequence the next day was able to speak to his wife and his father. But the night after I was called up, the patient having suddenly fallen into a comatose condition. At eleven o'clock he is said to have spoken and told the doctor in charge that he felt comfortable. At two o'clock I found him completely unconscious, with feeble conjunctival reflex, small thready pulse, collapsed, the skin cold, and strongly marked Cheyne-Stokes' breathing. The patient died at five o'clock in the morning, after several bloody evacuations of the bowels.

He had during the course of treatment been given two grms. extr. secalis corn. in the form of injections, and about fifty mgrms. of morphia and opium, part of which was injected, the other part being given in the form of suppositories. After what had happened we could have no hesitation in diagnosing an ulcer with hæmorrhage. Two questions only remained to be answered: first, whether the ulcer was situated in the stomach or in the duodenum; and secondly, what was the cause of the final catastrophe? Had perforation taken place, or a complication arisen in the form of cerebral hæmorrhage? The somnolent condition and the type of respiration, which is chiefly, though not exclusively, observed in cases of injury to the brain, were in favour of the latter supposition; absence of air in the abdominal cavity, and evident absence of great sensitiveness in the abdominal wall, spoke against the former.

The autopsy yielded the following results (fig. 18):—

The abdominal walls were moderately bulging and distended. A small quantity of air escaped on opening the abdominal cavity. A considerable quantity of fresh blood was found in the abdominal cavity. The coils of intestine were somewhat flabby, and the peritoneum slightly injected. In the middle of the anterior wall of the stomach was a four-sided opening, about the size of a bean, the edges of which were stained with blackish blood. The serosa of the stomach was dotted with numerous greenish stipplings. In the stomach were five losses of substance, varying in size and depth, the largest being situated at about an equal distance between the pylorus and the cardiac orifice, the others in the lower part of the stomach. The large ulcer was almost rectangular in shape, and measured 4·2 cm. long by 2 wide. It extended to the serosa, and in the part lying nearest to the pylorus was the above-mentioned rupture, divided into two parts by a thin, filiform bridge, formed by the serosa. The serosa was somewhat thicker towards the middle of the base of the ulcer, but in the part lying nearest to the cardiac orifice it again became thin and transparent like tissue paper. In this place an extremely sinuous thrombosed vessel, about as thick as a pin, from which the fatal hæmorrhage proceeded, entered the base of the ulcer. The edges of the ulcer formed in the middle and lower part a thickened and undermined ridge. In the upper part, towards the cardiac orifice, they passed by a gradual transition into the intact mucous membrane.

Of the other ulcers, some were confined to the mucous membrane, and none penetrated further than the muscular wall. In one of them the remains of a small thrombosed vessel were also

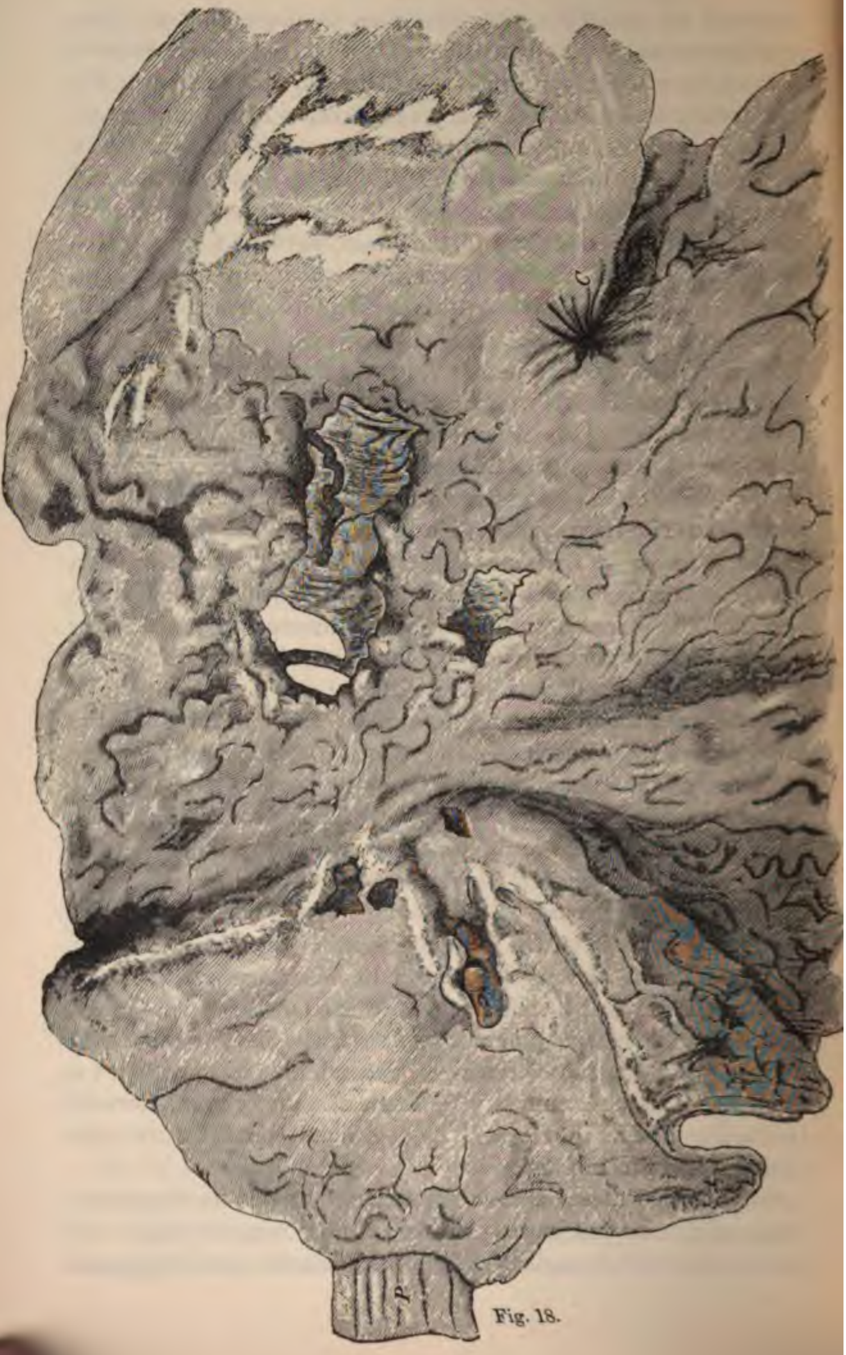


Fig. 18.

observed. With these exceptions, the mucous membrane was normal, except that numerous greenish dots were visible, such as I mentioned above in connection with the serosa. The microscope showed a catarrhal condition of the fundus and of the pylorus, with abundant cell infiltration and cloudiness of the gland cells. The "green dots" were not caused by extravasated blood, but by the unusual width and extreme sinuosity of the vessels of the submucosa (particularly the veins, which were filled to their utmost extent with blood). No waxy degeneration was found. The intestines contained large quantities of thin fluid blood. The other organs of the abdominal cavity were intact, but extremely anæmic.

Gentlemen, the case just described deviates greatly from the common type of ulcer of the stomach, not only with regard to the course, or rather the latency of the disease, but also because of the somewhat uncommon shape of the ulcer and of the rupture, and because of the unusual phenomena to which the rupture itself gave rise. I shall return to the subject during the course of my lecture. With your permission, I will now discuss the symptoms of the round, or more properly speaking the chronic, eroding ulcer of the stomach, and leave the subject of acute ulcerations which arise in consequence of corrosive poisoning to be discussed under the heading of toxic gastritis.

The round, chronic ulcer of the stomach is not quite correctly named, as its course is occasionally acute or subacute, and it is by no means always round, but is subject to manifold variations in shape.

Clinicists have devoted much time and trouble and made many experiments with a view to discover the causes which lie at the root of ulcer of the stomach. The first careful and exhaustive description of this affection was made by Cruveilhier, who by means of an interesting *post-mortem* examination first raised the *ulcus ventriculi* to the rank of a well-defined and recognisable form of disease, and this coincided with the beginning of the experimental period of medical science. Ulcers of the stomach, that is to say, circumscribed losses of substance in the mucous membrane which penetrate to the submucosa and muscular walls, may be produced in animals in different ways, but all owe their origin to a more or less temporary local disturbance of nutrition in circumscribed portions of the mucous membrane.

Either there is embolism of a circumscribed vascular area with consecutive necrosis of the tissues and sloughing which is attacked by the gastric juice, the parts being deprived of normal nourishment, in exactly the same manner as under favourable conditions larger portions of the stomach in the cadaver are softened (digested) by means of the gastric juice. This happens with artificial embolisms, ligature of small vessels, injury of, or hæmorrhage produced by certain definite parts of the central nervous system. Or the ulcers are the result of a direct mechanical, chemical, or thermic lesion of the mucous membrane, and ultimately are equally to be attributed to an alteration of the circulation in the irritated parts. But these losses of substance heal remarkably quickly, cicatrisation extending from the edges to the centre with help from the tissue of the mucous membrane. The experiments of Griffini and Vassale* have proved that the mucous membrane of the fundus of the stomach is repaired by the formation of genuine peptic glands from the epithelium which first forms over the wound, which is derived from the glandular epithelium of the margin of the wound; this work of reparation goes on so quickly that later on there is a difficulty in finding the place where the injury has been, and after ten or fifteen days no traces of it remain. These processes are in reality merely acute defects of the mucous membrane and cannot properly be called ulcers, because an ulcer, at least at one stage of its existence, must have a tendency to spread. Another factor must be added for the production of chronic ulcers: a natural or artificial failure of due proportion between the secretion of the gastric glands and the nourishing blood—caused either by the hyperacidity of the former, or the deterioration of the latter, or by both causes at once—must precede, or exist simultaneously with the local lesion. Ebstein,† following up an experiment of Schiff's, produced hæmorrhage of the stomach with eroding ulcers and even rupture by means of an injury to the anterior corpora quadrigemina. We may safely assume that there was an excessive secretion of acid, which perhaps took place in consequence of cerebral irritation: Koch and Ewald produced ulcers which penetrated to a great depth by pouring an over-acidulated solution of 5 per mille hydrochloric acid into the stomachs of animals in which they had, following Schiff, produced hæmorrhages of the stomach by cutting the spinal cord.* Quincke and Daettwyler † rendered animals anæmic by means of venesection; Silbermann ‡ produced hæmoglobinæmia with its consequences by the use of substances which act as solvents of the blood corpuscles. Under such conditions the losses of substance made in the manner described above heal tardily, or even, as in the case of an experiment made by Silbermann, lead to rupture. Not until these conditions are all fulfilled are the experiments on animals analogous with what we observe clinically in man as ulcer of the stomach. In man, too, if we confine our attention to typical ulcer of the stomach, and leave secondary ulcerations in cancer or gastritis phlegmonosa out of the question, we have a twofold course of the disease to describe.

---

* L. Griffini and G. Vassale. Ueber die Reproduction der Magenschleimhaut. Beiträge zur pathologischen Anatomie, &c. Ziegler and Nauwerck, Bd. 3, Heft 5, p. 425.

† W. Ebstein. Experimentelle Untersuchungen über das Zustandekommen der Blutextravasate in der Magenschleimhaut. Arch. f. exp. Pathol. Bd. 2, p. 183.

It is doubtless true, as has often been pointed out, that ulcerations frequently occur, that is to say, defects in the mucous membrane, in the meaning we have just attached to the words, which do not attain to any clinical expression, or only present indefinite symptoms instead of those of the typical ulcer of the stomach, neither growing to any great extent nor cicatrising in the proper sense of the word. The hæmorrhagic erosions of Rokitansky, which he himself looked upon as preliminary stages of true ulcer, belong to this category,§ in which must also be placed the so-called follicular ulcers which result from swelling, and at times suppuration of the gland follicles. The factors enumerated above often enough give rise to these processes. We need only mention the frequent occurrence of circumscribed hæmorrhage into the mucous membrane in chronic catarrh, particularly in drunkards, irritation of the mucous membrane by hot ingesta, or artificial lesions which are produced in it by the introduction of the sound, to recall to our minds a number of such factors, for one of which—transient hæmorrhage and follicular suppuration after irritative ingesta—Beaumont, the Canadian, serves as a classical witness for all time.* Can it be that in the many cases in which sharp objects, fragments of bone, the blades of knives or daggers, &c., are swallowed intentionally or by mistake, no lesion of the wall of the stomach takes place? Yet ulcer of the stomach is a rare occurrence in such cases. One of the most remarkable instances of the truth of our remarks, and at the same time a startling proof of what the stomach will bear, is recorded by Dr. Marcet, in the case of a sailor, John Cumming.†

---

* See Part I., p. 117. I must remark that our experiments were not made with this purpose, to which they are, however, completely pertinent.

† H. Quincke and Daettwyler. Correspondenzbl. f. Schweizer Aerzte, 1875, p. 101.

‡ O. Silbermann. Experimentelles und Kritisches zur Lehre vom Ulcus ventriculi rotund. Deutsche med. Wochenschr. 1886, No. 29, p. 497.

§ C. v. Rokitansky. Lehrb. d. pathol. Anatomie, 3rd Edition.

In the year 1799, an American sailor at Havre saw a juggler perform the trick of swallowing a knife. On returning somewhat intoxicated to his ship, he attempted to swallow his own open pocket knife, and doing so successfully went on to "eat" three more. Three of these were during the next few days carried away in the evacuation of the bowels, the fourth was never seen again; six years later he again treated himself to a supper of six knives, this time not without disagreeable consequences, which, however, soon passed off under hospital treatment. He went on in this way till he had swallowed about thirty-five knives. At last he became seriously ill, and died at Guy's Hospital in London, in the year 1809. The stomach was found to contain thirty blades, some of them very rusty, besides various handles; two blades in the colon and rectum, were sticking crosswise; they had perforated the wall of the bowel (as I may remark in passing, without causing peritonitis), but there was neither fresh nor old ulceration in the stomach, nor any trace of it to be found.

We cannot suppose that these continued assaults upon the mucous membrane of his stomach took place without any lesion, but it is none the less true that he did not develop ulcer of the stomach. It is also reported that up to the end he had a very good appetite and no distressing symptoms.

---

* W. Beaumont. Experiments and observations on the gastric juice and the physiology of digestion. Boston, 1833, p. 108. The passage of the remarkable book to which we refer runs thus: "Occasionally (and particularly after the irritation of the mucosa by ingesta) vesicles or little dark red spots may be found thinly scattered among the folds of the mucous membrane and projecting slightly above its surface. At first they are red and strictly circumscribed, but are as a rule afterwards filled with whitish purulent matter. At other times irregular red spots appear varying in size from half an inch to an inch and a half. Small aphthous patches may also be observed in connection with these red spots."

† Marcet. Med.-chirurg. Transact., vol. 12, p. 72.

If the above-named injuries always produced typical *ulcus ventriculi*, this disease would be observed much more frequently than is the case; its presence would in fact be the rule, and its absence the exception. Let us take, for instance, the occurrence of ulcer in cook-maids, on which so much stress has been laid! It is true that their calling renders them peculiarly liable to the temptation to swallow hot food. But how many people, not to speak of men cooks, swallow their food as hot as possible, without developing ulcer of the stomach, and how small is the percentage of cooks who suffer from this disease as compared with the sum total of the members of this honourable calling. It is evident that in every case a second factor must be at hand, to render possible the chronic development of the injury which has been made and its consequences, the injury thus forming to a certain extent the base on which the ulcer, *κατ᾽ ἐξοχὴν*, may be developed. The much-discussed problem why some ulcers heal, while others are progressive, can only be solved by the existence of a permanent or temporary "predisposition" of this kind. There is no lack of analogy for these conditions. I need only cite the example of tubercle bacilli with which you are all at present so familiar. Here, too, we have the causal *noxa* to which numberless persons in numberless instances are exposed; but in order that they may become tubercular it is necessary to have the predisposition, which happily most persons have not. In the case of human beings this predisposition to ulcer of the stomach consists in a morbid failure of the due relations between the constitution of the gastric juice and the blood, in exactly the same way as we have already proved it to be necessary for the production of artificial ulcers in animals. It is not the alkalinity of the blood which prevents the self-digestion of the mucous membrane of the stomach, and the further growth of the ulcer, as Pavy * explained some time ago in a communication so remarkably simple that it met with immediate and almost universal approval; for the old theory that the alkaline reaction of the lower layers of the mucous membrane of the stomach, under normal conditions, prevents digestion by the gastric juice is no longer tenable. Apart from the fact that this theory offers no explanation for the non-digestion of the superficial layers of the mucosa which are known to have an acid reaction, Edinger has attempted to bring direct proof of the acidity of the lower layers of the mucous membrane.* And even if we do not fully accept the evidence of his experiments, for which I have given reasons in a passage quoted below, yet it is certain that in this condition an alkaline reaction as such is not sufficient protection—alkali-albumen being also digested—because, as Samuelson† has proved, acid may be added to the blood, till a neutral reaction is produced without self-digestion of the stomach resulting. This investigator adduces other weighty reasons, and in particular points out the contradiction that the acids which are formed in the glands and pass thence into the stomach cavity are not neutralised, but are said to be so when they pass in the opposite direction, from the stomach cavity to the mucous membrane. Either there is no available free alkali in the neighbourhood of the acid, or the outcoming acid must be as little neutralised as the ingoing. Further, Sehrwald‡ has proved that the course of diffusion of alkali through the wall of the stomach into an acid solution poured into the stomach is quite different in the living animal to what it is in the excised stomach, being in the latter case far more energetic than in the former: a striking phenomenon, which can only be explained by the influence of the living cells upon the course of the physical process. How comes it that an ulcer cicatrises although the protecting vascular network is destroyed by the ulcerative process? Why does not the pancreas, for instance, digest itself? Our knowledge of the zymogenous substances§ cannot solve this, and a problem still confronts us, the solution of which is not to be found in the recognition of a "vital energy of the cells," the so-called "living principle" of Hunter.

---

* Pavy, On gastric erosion. Guy's Hosp. Reports, 14, 1868.

Gentlemen, we must bear in mind that normal gastric juice, if the constitution of the blood is also normal, neither causes the development of ulcer from any of the conditions previously discussed, nor favours its progress, nor checks its healing. *The failure of due proportion between the acidity of the gastric juice and the constitution of the blood* is always necessary to produce these results.

---

* Edinger. Ueber die Reaction der lebenden Magenschleimhaut. Pflüger's Archiv. Bd. 29, p. 247. Vide Part I. p. 100.

† Samuelson. Die Selbstverdauung des Magens. Preyer's Sammlung physiol. Abhandl. 1879, 2nd series, Heft 6.

‡ E. Sehrwald. Was hindert die Selbstverdauung des lebenden Magens? Münchener med. Wochenschr. 1888, Nos. 44 and 45.

§ Vide Part I., p. 105.

Leube[*] expresses his opinion that "the simultaneous appearance of two factors—anæmia and an abnormal degree of acidity of the gastric juice—must be assumed in chronic ulcer of the stomach," but he, as did Pavy, discusses at length the question whether diminished alkalinity or increased acidity is capable of itself of producing ulcer, whereas, in my opinion, these factors merely serve as adjuvants, and the alkalinity is not so important as the altered constitution of the blood and the defective nutrition of the cells caused thereby.

Cohnheim,[†] an uncompromising supporter of the alkalinity theory, states as an argument in its favour, that tumours in the stomach are not digested by the gastric juice, because they are very vascular, and thus contain a correspondingly large amount of alkali. But we know that in malignant tumours the digestive power of the secretion is considerably diminished, and that, on the other hand, many very vascular tumours ulcerate, that is to say, are digested, in spite of their blood supply, and we know too that it is from this blood supply and from the vessels that hæmorrhage arises. Just where we should suppose the possibility of neutralising the acidity of the gastric juice to be greatest, its eroding influence is felt, thus destroying Cohnheim's argument, which at first sight appears to throw much light on the subject.

The views expressed above rest on the basis of the most modern research. We have long known that eroding ulcers of the stomach are determined by anomalies in the constitution of the blood. *Suppressio mensium*, chlorosis, and anæmia after confinements have been too often observed in connection with ulcer of the stomach for it to be possible to doubt their causal relation to it. Miquel,[‡] even quotes cases in which the menses ceased and then returned, but in which every period was accompanied by a recrudescence of the gastralgia. Crisp[§] collected fourteen cases of perforating ulcer of the stomach in women, in thirteen of which there was at the same time irregularity or failure of menstruation. Wilson Fox,[||] on the other hand, on the authority of one case of hydrochloric acid poisoning with perforating ulcer, raises the supposition that "excessive secretion or excessive acidity of the gastric juice, particularly when the stomach is empty," may give rise to the formation of ulcer. But the researches of v. d. Velden, Riegel, Ewald, Jaworsky, Boas, and others, first gave the direct proof that the ulcer is, in many cases, combined with hyperacidity of the gastric juice. One of the above-named accidents may be the primary cause of the ulcer. Among these causes may be reckoned traumatic or thermic irritations, violent vomiting, hæmorrhage from congestive conditions, hyperæmia, and stasis in circumscribed vascular areas of the mucous membrane, hæmorrhagic infarcts, spasm of the vessels, and atheromatous, amyloid, or aneurismal degeneration. But there is no doubt that these lesions often affect the stomach without producing ulcer, in which case there is failure of the above-mentioned fundamental conditions. Should there be a development of a progressive ulcer, one or other of these anomalies will be found to lie at the root of it. Healing will not take place till the cause has been removed, that is to say, till there is a possibility of reactionary inflammation of the surrounding parts, or of the base of the ulcer, and consecutive cicatrisation.

---

[*] O. Leube. Die Krankheiten des Magens, 2nd Edition, 1878, p. 98.

[†] Cohnheim. Allgemeine Pathologie.

[‡] Miquel, Hannover. Zeitschr. f. prakt. Heilkunde.

[§] Crisp, On perforation of the stomach. Lancet, August 5th, 1843.

[||] Wilson Fox. Chronic ulcer of the stomach. Reynolds' System of Med., vol. 2, p. 930.

This is the simple explanation of the well-known tendency to relapse in cases of ulcer. In my opinion, relapses occur when there is a cessation of the beneficial effects of the remedies applied to the primary disease and a return to the former condition. In accordance with this theory is the fact that the greater number of cases of relapse in ulcer are made up of patients of nervous and chlorotic temperament, in whom, as is well known, the process of healing is slow and the tendency to relapse marked.

Perhaps, gentlemen, you will object that many diseases with abnormal constitution of the blood lead to gastric hæmorrhage without the occurrence of a typical ulcer. Cirrhosis of the liver, for instance, in which hæmorrhage in the mucous membrane of the stomach often occurs in consequence of the retarded circulation of the portal vein, but in which ulcer of the stomach is a merely occasional phenomenon. My answer is that these processes diminish the acidity of the secretion by means of the consequent hyperæmic and catarrhal condition of the mucosa, thus causing a failure of the necessary disproportion between the blood and the gastric juice, although both components have undergone an alteration. We must accept as causal factors not only hyperacidity of the gastric juice, but also an altered constitution of the blood when the acidity is normal. In opposition to the opinion held by Riegel and his followers, and recently set forth in many publications, that ulcer is always accompanied by an abnormal acidity of the gastric juice, I must maintain my opinion that this, though frequently, is by no means always the case. Riegel* says: "It can no longer be doubted that hyperacidity is a constant phenomenon in ulcer, as in the three hundred and eighty-two analyses of forty-two cases made by us last year it was found without exception." Gerhardt,† in opposition to this, states, as the result of his experience, in a paper read after the publication of the first edition of this work, that out of twenty-four patients in his wards suffering from ulcer of the stomach, seventeen, when examined at the right time, showed hydrochloric acid with the colour reaction, but seven did not; and the statements made by Rosenheim,‡ in the discussion following Gerhardt's paper, are still more important. He found, on examining by Cahn and Mering's method, the stomach contents of eight patients, all undoubtedly suffering from ulcer, that there was hyperacidity in only two cases (over 3·3 per mille of hydrochloric acid); in four the estimations were within the normal limits (2·4 to 3·3 per mille), and in two the hydrochloric acid contents were reduced to 1·8 and 1·6 per mille respectively. Although the latest researches of von Pfungen§ have proved that the above-mentioned method does not by any means show the free hydrochloric acid only, but also the sum total of the acidity of free acids and acid salts, which are influenced in a varying and uncontrollable manner by the ingesta, yet this much is certain, that there is not a constant hyperacidity in ulcer.

In order to prove the incorrectness of the above-mentioned dogmatic statement, it is only necessary to quote a case to the contrary. In the beginning of this lecture I reported an undoubted case of this kind, and could quote others from my case-book. Not to mention the observations already quoted, exactly the same result was obtained in the estimation of acid in ulcer of the stomach made by Cahn and v. Mering, and by Ritter and Hirsch.* The latter, having made eight examinations in five different cases, found only in two a degree of acidity above the normal maximum in healthy persons; and, further, they proved the existence, in quite healthy persons, or at least such as were not suffering from any manifest disease of the stomach, of hyperacidity of the stomach contents, a result which I also have frequently had occasion to observe.

---

* F. Riegel. Beiträge zur Diagnostik der Magenkrankheiten. Zeitschr. f. klin. Med. vol. 12, p. 434.

† C. Gerhardt. Ueber Zeichen und Behandlung des einfachen chronischen Magengeschwürs. Deutsche med. Wochenschr. 1888. No. 18, 3rd May.

‡ Ibid, No. 22, 13th May.

§ R. v. Pfungen. Beiträge zur Bestimmung der Salzäure im Magensaft. Wiener klin. Wochenschr. 1889, No. 7, et seq.

These cases, gentlemen, are exceptional; but they are at the same time authentic and so well vouched for that it is impossible to disregard them, and Riegel's dictum should therefore run thus: "In ulcer of the stomach the gastric juice always contains hydrochloric acid, and usually does so to an abnormal degree." I need not call your attention to the importance of this conclusion for the purposes of diagnosis, and especially of differential diagnosis. Riegel believes that an ulcer is developed in consequence of this hyperacidity: "In consequence of the latter, an erosion and injury to the stomach, slight in itself and inclined to heal rapidly, assumes a more serious aspect, the process of healing is rendered more difficult, and the ulcer spreads."† A second possibility, also borne out by fact, is that in individuals with a tendency to ulcer with great sensitiveness of the nerves of secretion, hyperacidity may be developed, at the same time as the typical ulcer, in consequence of the injury; that is, as Ritter and Hirsch observe, that hyperacidity may just as well be the consequence as the cause (or, as I should say, the first foundation) of the ulcer.

The idea that the secretion of hyperacid gastric juice is necessary for the production of ulcer of the stomach, is by no means new, but like all the questions which have lately held a foremost place in the pathology of the stomach, was raised long ago, although not worked out by means of exact methods. It is closely connected with the question of gastromalacia, softening of the stomach, which when it is not a cadaveric phenomenon, is in reality nothing else than a large ulcer of the stomach, with acute, progressive development. Rokitansky and Camerer held that in such cases a hyperacid secretion of gastric juice took place in consequence of paralysis of the vagus nerves. Günsberg[*] believed a hyperacid secretion to be necessary for the development of perforating ulcer. He says "the (ulcerative) destruction of the mucous membrane of the stomach proceeds from a quantitative anomaly in the secretion of free acids." His opinion rests chiefly on the fact that in a case of perforating ulcer, the gastric mucus gave a strongly acid instead of the ordinary alkaline reaction, his error being that, according to the views then held on the nature of the free acid in the gastric juice, he ascribed this acidity to lactic acid. You see, however, gentlemen, that in this as in all else, we stand on the shoulders of our predecessors, and that the many overt and latent claims to priority, on close examination, rest on very slight foundations.

---

* Ritter and Hirsch. Ueber die Säuren des Magensaftes und deren Beziehung zum Magengeschwür bei Chlorose und Anämie. Zeitschr. f. klin. Med. vol. 13, p. 446.

† F. Riegel. Zur Lehre vom Ulcus ventriculi rotundum. Deutsche med. Wochenschr. 1886, No. 52, p. 931.

We must in this place merely mention the remarkable coincidence of burns of the skin with ulcers in the stomach and duodenum of young persons, first observed by Curling,[†] and afterwards by Dupuytren, Cooper, Erichsen, Wilks, and others, for which we are at present unable to account. Holmes found in one hundred and twenty-five severe cases of burn, ulceration of the duodenum in sixteen cases, and of other parts of the bowel in two.[‡] The earliest period of its appearance after the burn was from the fourth to the sixth day. Ulcers of the stomach, of which Rokitansky, Low, Wilks,[§] and Pitt,[||] quote instances, appear to be much less usual.

Finally, gentlemen, micro-organisms have been mentioned as causes for the origin of ulcer. Letulle,[¶] in a case of recent ulceration of the stomach, which had arisen during the course of a puerperal septicæmia, found numerous streptococci in the veins of the submucosa of the stomach and in the uterine veins, the pure culture of which, when injected into guinea-pigs, produced in these animals ulcerations of the stomach, which threatened to perforate the walls of the artificially inflated organ. Letulle obtained the same results in four cases with *staphylococcus pyogen. aur.*, cultivated from various abscesses, and in one with the microbes of dysentery discovered by Chantemesse and Vidal, which in the cases in point had been taken from a man who had returned from Cochin China with chronic dysentery, and afterwards developed ulcer of the stomach. It is said that in this case there was either embolic plugging, or a direct invasion of the mucous membrane which led to the formation of necrotic foci and the digestion of circumscribed areas. We will content ourselves for the present with the mere record of these statements.

---

[*] Fr. Günsberg. Zur Kritik des Magengeschwürs, insbesondere des perforirenden. Arch. f. physiol. Heilkunde, 11. Jahrg. 1852, p. 516.

[†] Curling. On acute ulceration of the duodenum. Med. Chirurg. Transact. vol. 25, p. 260.

[‡] Holmes. Syst. of Surgery, vol. 1, p. 733.

[§] Wilks. Cases of deaths from burns and scalds, Case 77. Quoted by Falk, Ueber einige Allgemeinerscheinungen nach umfangreicher Hautverbrennungen. Virchow's Arch. vol. 53, p. 27, 1871.

[||] Pitt. Stomach with umerous superficial nerosions following after an extensive burn. Transact. Pathol. Soc. London, 1887, p. 38, 140.

[¶] M. Letulle. Origine infectieuse de certains ulcères simples de l'estomac ou du duodénum. Compt. rend., tom. 106, No. 25.

So much, gentlemen, for the probable origin of ulcer of the stomach. I have begun by stating these various opinions, because they are vexed questions of the day, and are also of the utmost importance both for treatment and prognosis. Let us now take a short survey of the clinical facts.

I will begin by giving you some statistics, which, as they are taken from the registers of *post-mortem* examinations, of course refer only to typical perforating ulcers, or such as are followed by the formation of cicatrices.

The frequency of ulcer of the stomach seems to vary in different countries. Lebert believes that the average for Europe amounts to between four and five per cent., and supports his opinion by the statistics of Brinton and Jacksch together with his own; but there is no doubt that in many places the figures are considerably higher and in others lower than these averages. Passing over the fact that the statement by Lebert of Jacksch's statistics is incorrect, the numbers amounting to 3·2 not 5·8 per cent., we find that Berthold (Berlin) gives 2·7 per cent., Nolte (Munich) 1·23 per cent., while, on the other hand, Griess (Kiel) gives 8·3 per cent.; the percentage in Jena is 10, and Starck gives as much as 13 per cent. for Copenhagen. These statistics being made from a large number of cases, are fairly free from the inaccuracy which always attends smaller numbers, and may thus be accepted as proof of a certain local diversity, which need not surprise us if we consider that the origin of ulcer of the stomach may in part be traced to direct irritation of the mucous membrane, and that the influence of this factor varies with the habits of life and the different kinds of food taken in different places.

It has often been pointed out, and among others by Gerhardt in his observations in Thuringia, that insufficient nourishment may give rise to the development of *ulcus pepticum*. Sohlern,* looking at the matter from another point of view, has pointed out that in certain districts of Germany, the Rhone valley and the Bavarian Alps, and also in the greater part of Russia, the so-called Great Russia, ulcer of the stomach rarely appears, and that it is a remarkable fact that the inhabitants of these districts live, for the most part, on a vegetable diet; but in spite of this we have to do, particularly in Russia and in Bavaria, with a race which, taken as a whole, is strong and well fed. As it is well known that almost one-third more potash is supplied to the blood by a vegetable than by a mixed diet, this constantly increased supply would cause an increased amount of potash in the blood, and many observers have proved that the red blood corpuscles are the chief recipients of potash. Sohlern is of opinion that this increased amount of potash would account for the relative immunity from ulcer of the above-mentioned races, which opinion harmonises completely with the rare occurrence of ulcer in vegetable-feeders, whose blood is known to be particularly rich in potassium phosphate. On the other hand perhaps diseases such as chlorosis, anæmia, &c., connected with changes in, or reduction in the number of the red corpuscles of the blood, would lead to the formation of ulcer because they have as a consequence blood poor in potash.

Unfortunately, as Sohlern himself points out, these interesting observations are not founded on a series of examinations of the blood, but in spite of this it is impossible to overlook the importance of the facts brought under our notice.

Statistics are almost unanimous with regard to the other accessible factors—sex, age, position of the ulcer, and frequency of rupture. It is proved that the female sex is everywhere more often attacked than the male, the average proportion being that of two to one. It is equally certain, if we consider all the factors which influence the development of the disease, that it appears most frequently between the twentieth and fortieth years, the mortality being greatest between the fortieth and sixtieth years. This is not altered by the facts that Grünfeldt* out of 450 autopsies of old people, found cicatrised ulcers of the stomach in ninety-two, that is to say, twenty per cent. of all cases; that Chiari† observed a case of fresh perforation in a man seventy-one years of age, and Sedgwick ‡ in another eighty-two years of age, or that Henoch § states that ulcer of the stomach is not infrequent in very young children. These latter cases at least have nothing to do with typical ulcer of the stomach, as they are probably produced by intrauterine injuries, or such as are connected with birth, and are only met with in the very earliest infancy. The age between ten and fifteen years is almost completely exempt from mortality. Still I think it very probable that ulcer of the stomach appears at this time of life too, but that in consequence of the greater regenerative and plastic powers in youth, there is a more pronounced tendency to heal at this age than later. I have observed at least two cases which could only be diagnosed as ulcer of the stomach, and in which hæmorrhage of the stomach only was wanting to complete the typical symptoms. No doubt it appears much more rarely in childhood than in later life, because children are much less exposed to those injuries which serve as factors for its development.

---

* v. Sohlern. Der Einfluss der Ernährung auf die Entstehung des Magengeschwürs. Berl. klin. Wochenschr., 1889, No. 14.

After what has been said at the beginning of this lecture, it seems to me more than doubtful whether occupation has anything to do with the development of ulcer of the stomach. We may, however, mention once more the well-known observation of the frequency of its occurrence in maid-servants, and especially in cooks. In English literature its origin is often ascribed to want of proper food, and it is compared with the development of corneal ulcer in very weak and cachectic patients.

---

* Grünfeldt. Hospitaltid. 2 R. 9, p. 765, quoted in Virchow-Hirsch's Jahrb., 1878.

† Chiari. Fall von Perforation eines Magengeschwürs. Anzeiger der k. k. Gesellsch. d. Aerzte zu Wien., 1880, p. 161.

‡ Sedgwick, On Perforating Ulcus of the Stomach. Dublin Hosp. Gaz., 1855.

§ Henoch. Vorlesungen üb. Kinderkrankh. Berl. 1883, 2nd Edition, p. 61.

MORBID ANATOMY.

There is no doubt that a large number of ulcers of the stomach arise from a direct lesion of the vessels, and from hæmorrhagic infarction resulting from it, the primary cause being either abnormal position of the smallest arterial vessels, which rise from the submucosa between the gland tubules of the mucosa, or atheromatous, waxy, or aneurismal disease of the walls of the vessels, cerebral injuries, or even simple processes of obstruction, which lead to the bursting of the vessels. These processes, that is to say, the formation of hæmorrhagic infarcts, have been most lucidly explained by Hauser, and my examinations, made with the help of Dr. George Meyer, which I shall describe later on, lead me to coincide almost completely with his views.*

But these causes alone are not sufficient, because numerous cases occur, especially in young persons, in which there is no sign of disease of the vessels or of the other etiological factors already mentioned. In such cases we must assume that the ulcer is developed from the follicular hæmorrhages and hæmorrhagic erosions described by Rokitansky, which have the same effect on a small scale as hæmorrhagic infarcts on a larger, that is to say, they cut off small areas of mucous membrane from normal nutrition. Carswell's atlas contains the representation of a well-marked case of follicular hæmorrhages and punctiform hæmorrhages in the orifices of the follicles, partially surrounded by a circular area of extravasated blood. In a stomach, treated directly after death by Heidenhain's method (small pieces were put at once into absolute alcohol, which was frequently changed, and then into hæmatoxylin and bichromate of potash), in which the mucous membrane was infiltrated with blood, I have found in many places that the gland tubules were plugged with unmistakable red blood corpuscles as far as the neck of the gland, and down to the fundus, which could only have come from hæmorrhage from the surface of the mucous membrane, the hæmorrhage itself proceeding from the fine capillary network lying close under the surface (Henle). Hæmorrhages of this kind may be caused by a trifling local obstruction or an injury. They develop into hæmorrhagic erosions, rounded or small streak-like losses of substance, from the size of a pea to a millet seed, to which sometimes, when the mucous membrane is at the same time relaxed, blackish brown extravasated blood adheres. Their number varies, being sometimes very great, especially in the pyloric portion of the stomach, so that the mucous membrane appears to be dotted over with them. From these erosions typical chronic ulcers are developed. According to Förster,[*] this is the typical form of development for the *ulcus rotundum*, but we now know it is only in the limited number of cases where the origin cannot be ascribed to hæmorrhagic infarct that this process takes place.

---

* **Hauser.** Das chronische Magengeschwür. Leipzig, 1883.

But in whichever manner the ulcer is developed, it is, when considered from the standpoint of morbid anatomy, not an "ulcer" at all, but "a progressive necrosis of the tissue" which is utterly wanting in the chief characteristic of ulcer, namely, "the proliferation of young cellular elements which tend to penetrate further into the tissue and throw off more elements on the surface."[†] The ulcer does not grow by an active process taking place in the tissues with consequent decay, but by a passive process. Active participation of the tissues first takes place when there is cellular infiltration leading to cicatrisation.

A section from the edge of a recent ulcer, when seen under the microscope, shows the trough-shaped gland tubules descending towards the base of the ulcer as if they were cut off. They are simply eroded, that is to say, digested to the point at which the tissue is able to resist the peptic action of the gastric juice. Not till the ulcer is old is there a process of reactive inflammation in the periphery which leads to the formation of a hard edge. In this case the supporting fibres between the tubules which remain are thickened, and some of them are placed obliquely, a fact in accordance with an observation of Witosowski to which I am about to refer. As far as the glandular epithelium still exists in the lower part of the remains of the tubule, it has undergone a curious change. Cubical or cylindrical epithelium has taken the place of the rennet cells. They are shrunken so that they stand out separately from the membrana propria, their nuclei can no longer be recognised by staining agents, and their contents have a brittle, glassy look, more suggestive of hyaline degeneration than anything else. Some ducts have undergone cystic degeneration. The submucosa is swollen with abundant small-celled infiltration and a well-marked network of vessels; the fibres of the muscular wall are separated by a fibrillated meshwork of interstitial tissue, and some of them have been completely destroyed. You see, therefore, that the necrotic process is everywhere surrounded, both underneath and at the edge, by a zone of irritative processes, which, when more fully developed, lead to cicatrisation, by means of which the base of the ulcer is caused to adhere firmly to the subjacent tissue, and the mucous membrane at the edge is drawn down to the base of the ulcer.

---

[*] Förster. Lehrbuch der speciellen pathol. Anatomie. Leipzig, 1854.

[†] Virchow. Cellularpathologie, Fourth Edition, p. 537.

Witosowski * maintains that the gland tubules at the edge of the ulcer alter their position and turn their orifices towards the ulcer, so as to discharge their secretion into it. He believes that it is only by this means, together with a simultaneous process of proliferation from the submucosa, that an eroding ulcer—for which the folds of the mucous membrane always serve as foundation—can be developed. The latter process generally takes place, and is accounted for by the obstacles which hinder the circulation in these parts. The former I have never seen, and I cannot consider that the singular theory which Witosowski has founded upon it is worthy of discussion. The gland tubules do indeed, as Hauser remarks, and as I have often observed, turn towards the crater in old ulcers, but this is only because the muscular wall, in accordance with its natural elasticity, retracts beneath the edge of the mucosa; but secretion from these ducts is in the very nature of the case impossible. An abundant small-celled infiltration is always found in the interstices, but this is, however, not peculiar to ulcer, but is found equally in all processes which lead to inflammatory irritation of the mucous membrane, from slight catarrh to acute phlegmonous gastritis. An irritative condition of the surrounding part of the mucous membrane is a usual consequence of ulcer. I must remark in conclusion that occasionally several ulcers which were originally separate, join together into one large ulcerated area.

Gentlemen, the views just submitted to your notice are of the utmost importance both for treatment and in practice. For the logical conclusion to be drawn from them is that *ulcus ventriculi* is to be attacked from two sides, directly and indirectly, by means of local and general treatment.

---

* Witosowski, Ueber das Verhältniss der productiv entzündlichen Processe zu den ulcerösen im Magen. Virchow's Arch., vol. 94, p. 542.

We may pass over the rough anatomy of the ulcer and its consequences in a few words. Its funnel or crater-like formation, corresponding to the rising tree of blood-vessels, is well known; the edge is at first sharply defined, and forms afterwards into a wall-like ridge. Every medical student is familiar with the classical saying of Rokitansky that the ulcer looks as if "it had been stamped out with a punch," although this comparison only applies to old perforating ulcers, while it may also assume a linear, oval, or insular shape, or its edges may form steps. The base is for the most part smooth, or slightly uneven, and is sometimes covered with clots of blood or thick greenish or brownish mucus. The size varies, but is usually between that of a ten pfennige piece to a mark (*circa*, a sixpence to a shilling). An ulcer observed by Cruveilhier, which measured 16 cm. long by 8·5 wide, is generally quoted as a monstrosity, but I find a case described by Habershon in which the process nearly covered the entire space between the pylorus and the cardiac orifice. It is usually situated at the pylorus and on the greater curvature, the lowest part of the stomach when in an upright position, and the place where the gastric juice collects, so that according to Nolte the scale of frequency is as follows: at the greater curvature 22 per cent., in the *pars pylorica* 13, on the anterior wall of the stomach 3, on the posterior wall 2, and at the cardiac orifice 1.

In the majority of cases there is only one ulcer, it is seldom that three or more are found. Lange, however, in one case observed so many that "he was obliged to give up the attempt to count them."*

Should the base of the ulcer become flat and thickened in the course of the process, and the edges hard and bulging out like a wall, and should the position be such as to render these hard edges accessible to palpation, the false impression of a malignant tumour or new growth may be conveyed, as we shall explain later on. But should the ulcer be situated in the neighbourhood of the pylorus or of the cardiac orifice, cicatrisation may cause stenosis of the orifice with the clinical consequences which result therefrom.

---

* Lange. Deutsche Klinik, 1860, p. 90. "Besides which (the perforating ulcer) the whole wall of the stomach was covered not only with an infinite number of cicatrices of different depths and sizes, but also with such a quantity of uncicatrised ulcers, some only in the tunica mucosa, some penetrating to the muscular wall, some flat and some pit- or funnel-shaped, that I was obliged to give up the attempt to count them."

The result of the necrotic process is particularly interesting. We have to distinguish between—

1. THE FORMATION OF A CICATRIX.—Here there is a marked difference from the ulcers which can be artificially produced in animals. For while the latter, as Cohnheim states, and as I have also found, heal with restoration of the normal tissue of the mucous membrane, in man a fibrous cicatricial tissue is formed with a depression in the centre and the well-known tendency to contract. Thus rayed cicatrices are formed and the wall of the stomach is distorted, particularly when a fixed point is provided by its previous adhesion to neighbouring organs. Zonular constrictions are formed which force the organ into the shape of an hourglass or a gourd. By these means—as in the example now before you, which has been dried in superheated air—where the cicatrix is on the lesser curvature, the pylorus and cardiac orifice may be drawn together to such a degree that it is hardly possible to pass a pencil between them. Curious cicatricial bands or bridges too may be formed which lead to the formation of a complete sac, which process is well illustrated by Cruveilhier in his great work.*

2. PROGRESSIVE ERODING NECROSIS.—This process, when there is no cicatricial formation, continues so long as there is any formation of gastric juice, and is finally arrested by means of the complications which arise. These complications are:

(*a*) Erosion of vessels. According to the position of the ulcer and the depth to which it penetrates, larger or smaller vessels will be opened. The slight tendency to the formation of thrombi due to the erosive action of the gastric secretion is characteristic. The larger vessels, the coronary artery, the splenic artery, and the pancreatic artery are most often affected.

(*b*) Adhesion to neighbouring organs and perforation. When the necrosis reaches to the serosa there is either acute inflammation and adhesion to the neighbouring organs, with consequent extension of the process to these organs, or, when this is not possible, there is direct perforation into the abdominal cavity.

* l.c. 20 livrais. pl. 6.

Secondary perforations too may penetrate the intervening tissues and open into the pleura or the pericardium. All the neighbouring organs, liver, gall-bladder,* pancreas, omentum, diaphragm, heart, lungs, and intestines are more or less subject to these attacks, according to the position of the ulcer. All the organs in the abdominal cavity occasionally adhere together without the occurrence of rupture proper, as has been described in one case by Budd.

In conclusion we must mention *tubercular* and *syphilitic* ulcers.

Tubercular ulcers, which up to the present time have only been found in connection with tubercular lesions of other organs, are distinguished by their thickened, infiltrated, and wall-like edge. Their base is generally yellowish and granular. They are pale, and as in the cases described by Eppinger stand out in sharp contrast to their dark surroundings. Tubercular nodules with the characteristic giant cells—so far as I know all these observations were made before the discovery of the tubercle bacillus—are found in the base and in the edges. One or more ulcers may be present, and the mucous membrane and submucosa alone may be affected or the muscular wall also. In some cases the serosa corresponding to the base of the ulcer is covered with nodules the size of a millet-seed (Litten †). In the case mentioned by Litten the ulcer was rather large, measuring 4·2 by 3·3 cm., its edge was sharp and serrated, swollen in parts and infiltrated with blood; the remainder of the digestive tract was free from tubercular ulcerations, which were to be found in the larynx, the bronchi, and the lungs. A similar case is described by Talamon-Balzer, ‡ another by Gilles Sabourin, § and two more by Eppinger.‖ None of these ulcers belong to the type of eroding ulcer, in such cases it is rather a question of genuine tubercular foci of softening, such as appear elsewhere, with central caseous destruction of the tubercle, and perchance a combination of the eroding action of the gastric juice on the necrosed tissues.

The syphilitic ulcer possesses no special characteristic features.

---

* Habershon. Lancet, June 2nd, 1883, p. 951.

† M. Litten. Ulcus ventriculi tuberculosum. Virchow's Archiv. vol. 67, p. 615.

‡ Talamon-Balzer. Phthisie locale; ulcérations tuberculeuses de l'estomac et de l'intestin. Bull. soc. anatom. 1878, p. 374.

§ Ibid.

‖ l.c.

No very accurate observations have yet been made, and in the majority of cases it has not been ascertained whether a primary lesion or a degenerated gumma was in question.*

GENERAL ASPECT OF THE DISEASE.

Gentlemen, it is well known that there are ulcers of the stomach which cicatrise and run their course completely without symptoms, or at least without characteristic symptoms *intra vitam*, being only discovered by chance when an autopsy is made. Such cases as they have been observed by Williams, Abercrombie, and Chambers, possess no clinical history.

The complex of symptoms of *ulcus ventriculi* may be arranged in the following groups:—

1. Cases with preponderating symptoms of irritation, followed by hæmorrhagic erosion or the erosion and denudation of larger or smaller portions of the mucous membrane, without the occurrence of further complications.
2. Cases with the above-mentioned symptoms of irritation with hæmorrhage.
3. Cases with symptoms of irritation and perforation followed by healing or death.
4. Cases in which the disease takes a latent course until death is caused by hæmorrhage or perforation.

If we consider that the symptoms of the three first groups may be combined in various ways, to which may be added the consequences of cicatrisation, we shall see that we have to do with a varying and many-sided disease. The first stages show themselves by the discomfort, the obscure sensitiveness to pressure, the passing pains, and the disturbance of appetite which are found in the beginning of so many diseases of the stomach. The tongue is, however, usually clean, or only somewhat foul at its base. You will find on inquiry that the patient eats little and generally diets himself strictly, not from want of appetite but for fear of the pain which is likely to come on after large meals, gastralgia forming a characteristic symptom in the very early stages of the disease. The accompanying gastric catarrh is rarely so pronounced as to produce genuine anorexia, pasty taste, eructations, bad smell from the mouth, or extremely foul tongue.

---

* Galliard. Syphilis gastrique et ulcère simple de l'estomac. Arch. génér. de méd., 1886, p. 66, et seq.

Marked decomposition of the stomach contents with eructation of putrid gases appears only in the rare cases in which a zonular ulcer or a cicatrix hinders the peristalsis of the stomach and leads to dilatation of that organ.

Sluggish action of the bowels is the rule, diarrhœa, or a condition alternating between constipation and diarrhœa, the exception. It is rare for the functions of the bowel to be normal and underanged. Chronic ulcer takes its course without fever, and if it appears, either *sub finem vitæ* in conditions of extreme exhaustion, or in certain acute forms of ulcer, it is caused by inflammatory processes, gastritis, peritonitis, or pneumonia.

Recent ulcer of the stomach is not as a rule accompanied by noticeable disturbances of nutrition, which may even be absent during the later stages of the disease. Most patients, however, become emaciated in consequence of the scantiness of their diet, and often lose weight to a very serious degree, losses of twenty or more kilogrammes in a few months being not uncommon. This is partially dependent on the previous condition of nutrition, and affects stout persons more than it does thin ones.

The pain gradually fixes itself in a definite place corresponding to the position of the ulcer, and as this is generally in the lower part of the stomach and the position of the pain cannot be localised to a centimetre, it is generally referred to the epigastrium. The boring fixed pain frequently going through from the front to the back is characteristic. Many patients complain only of pains in the back, others of "stitches in the side," which may be confounded with intercostal neuralgia. The pain is usually increased by pressure, women cannot bear their stays, and men cannot draw their waistbands tight; in rare cases, however, pressure gives a feeling of relief. Attacks of pain generally come on when the unprotected surface of the ulcer is irritated by violent mechanical or thermal means. This naturally occurs first and foremost after eating, swallowing food being immediately followed by a directly irritating effect, either through the wall of the stomach being drawn by the weight of the food, or through the contractions connected with the act of digestion pulling the surface of the ulcer and irritating its nerves. But this is not the only cause. In patients suffering from ulcer of the stomach I have often seen gastralgia produced by drinking too cold liquids, or taking a spoonful of too hot soup, or a small quantity of too hot tea, &c. These are instances in which the pain must be referred to thermal irritation and not to any of the above-named causes. According to my experience pain is caused less often by too hot ingesta than by too cold, perhaps because the mouth and pharynx act to a certain extent as a protection to the stomach against the former, and the mucous membrane is more tolerant to high degrees of temperature than to low ones, and also because the former ingesta are taken in much smaller quantities than the latter. The nature of the ingestum is certainly not without influence on the behaviour of the mucous membrane, as is proved by a remarkable example recorded by Dr. Dunglison.*

Among the field labourers in Virginia working under the tropical sun, and quenching their thirst by drinking large quantities of cold spring water, numerous cases of severe, acute gastritis appeared, quickly followed by death. On giving them small pieces of ice instead of water, this form of disease almost entirely disappeared.

Many patients feel no pain after eating, but are subject to gastralgic attacks when the stomach is empty or even during the night. This must be accounted for by the hyperacid constitution of the gastric juice, secreted at a wrong time, which we shall discuss later. On the other hand distension of the wall of the stomach by gases and irritation of nerve fibres in the course of the development of the ulcerative process produce gastralgia, while it is more to be attributed to reflex action if it is brought on by chill or mental disturbance, or if the pain becomes more violent before the catamenia and decreases when they have commenced. The occasional appearance of cutaneous hyperæsthesia and anæsthesia, such as Traube has observed and attributed to a central influence, is peculiar.† The factors which cause the gastralgic attacks also cause them to come on with great violence, and to disappear as quickly as they came, so that the patient feels an almost immediate return to his normal condition, whilst he seldom complains of pain gradually rising to a paroxysmal height.

The next symptom which we have to consider is that of vomiting, and specially hæmatemesis.

Vomiting generally comes on soon after eating. It is a consequence of the irritation caused by food, and not, as in dilatation of the stomach, the reaction against the accumulation of obstructed ingesta. The food is brought up almost unchanged, and slightly mixed with mucus, as is the case in the so-called *vomitus matutinus* of drunkards. Fermentation fungi and other extraneous cellular elements, with the exception of the occasional admixture of blood, are absent, or are (sarcinæ) very rarely present.

---

* Quoted by Copland. Dictionary of pract. Med., article, Indigestion.

† Traube. Deutsche Klinik, 1861, p. 63.

Hæmorrhage may proceed in small quantities from small vessels, in which case it is observed only accidentally in the form of fine streaks of blood mixed with the vomited matter when it is recent, or as reddish brown granular masses when it has been longer exposed to the action of the gastric juice. Small quantities of blood may be overlooked when no vomiting occurs, and the blood leaves the stomach by the bowel. Here it becomes changed and cannot be recognised by inspecting the fæces. This can only be done by microscopical, spectroscopical, or chemical investigation, by which corpuscles or blood colouring matter may be detected in the fæces, and the cause of an obscure anæmia made clear.

Hæmorrhage on a larger scale acts on the stomach like an emetic and empties it of its contents, it is the result of erosion of a large vessel. Many patients have distinct premonitory symptoms, transitory heats, epigastric pulsation, fulness in the gastric region, with great and apparently causeless restlessness, as in the case referred to at the beginning of this lecture. In such cases, too, the time during which the blood remains in the stomach varies much, causing the appearance of the vomited matter to vary also. Clots of bright red coagulated blood are sometimes met with, at others brownish red matter, and again at times, but in the minority of cases, the vomit is like coffee grounds. Part of the blood passes into the bowel. This is the rule with slight hæmorrhages which do not lead to vomiting, the blood mixing with the other bowel contents, and being either overlooked, or not to be distinguished from the fæces. If violent hæmorrhage has taken place, or if the ulcer be in the duodenum, the matter evacuated looks like tar and has a very offensive smell. Blood in the vomited matter may usually be seen with the naked eye, but is always to be recognised by means of the microscope, the spectroscope, or Heller's blood test ; it is necessary, however, to remember that red wine, cocoa, coloured medicine, cinnamon, and real coffee which have been taken by the patient may give rise to confusion. A glance through the microscope will settle the question.

The average frequency of hæmatemesis is rather under than over fifty per cent. Brinton puts it at twenty-nine per cent., Gerhardt at forty-seven, and Witte of Copenhagen observed it one hundred times in three hundred and thirty-nine cases, from which we may assume that considerably more than half the number of patients do not suffer from hæmatemesis.

I hardly need say that it is necessary to guard against confusion with hæmorrhage from the œsophagus, from the gums, or from gaps in the teeth, and that the appearance of hæmorrhage in the initial stages of cirrhosis of the liver, in disturbances of the circulation, aneurisms, &c., must be borne in mind, the first of which (hæmorrhage from the œsophagus) may easily be taken for hæmorrhage from the stomach, profuse hæmorrhage from varicose œsophageal veins being common, especially in old people, and ulcer of the œsophagus also leading to hæmatemesis. The bloody matter, in cases of hæmorrhage from gastric ulcer, is free from specific elements, and the blood corpuscles preponderate so greatly that the cellular elements from the mucous membrane of the stomach are either entirely absent, or present to a very limited extent.

It is, under certain conditions, more difficult to diagnose an admixture of blood with the fæces, because the blood corpuscles become so injured by their passage through the bowel that their characteristic constitution is destroyed. This difficulty does not arise in cases of violent hæmorrhage, but only when it is slight, and especially when mercury or preparations of sulphur have been taken, which give a dark colour to the fæces.

When violent hæmorrhage has once set in the danger of its recurrence hangs like the sword of Damocles over the head of the patient. It may recur in two different ways: first, it returns once or more than once during the same day, or after a short interval, perhaps at the end of a week. When this happens a relapse from the first opened vessel may be assumed. Secondly, hæmatemesis reappears after a long interval of months or even years. In the latter case a new opportunity must have occurred for the hæmorrhage, occasioned by the predisposition of the individual. In my opinion a certain predisposition to defective coagulability of the blood, and at the same time an insufficient or defective formation of thrombi must be assumed, without which it would be impossible to account for the fact that in some cases large ulcers which could not form without affecting large vessels, pursue their course without hæmorrhage, while others are accompanied by abundant bleeding. The thrombus formed sometimes appears to be very loosely seated and is easily displaced, when the heart's action becomes stronger than normal. I have twice observed the recurrence of hæmorrhage after a long interval, when the patients, yielding to a deceptive feeling of improvement, have taken strong alcoholic drinks, although only in small quantities.

Slight hæmorrhages have little influence except on the mental condition of the patient; violent hæmorrhages, especially if recurring at short intervals, lead to extreme anæmia and its consequences. Waxlike pallor of the skin, small, frequent pulse, slight onsets of fever, noises in the ears, giddiness, loss of consciousness, transitory quiet delirium, and complete anorexia appear. *Subsultus tendinum* and cramp in the extremities, as in cholera, have been also observed. But in spite of all this the patient usually rallies and regains his strength comparatively quickly if put under proper treatment. Cases of fatal hæmorrhage from the vessels of the stomach are comparatively rare. As a rule death is caused by perforation of the ulcer, such as we are about to describe, or erosion of the splenic or pancreatic artery, or of the portal vein or the left ventricle of the heart. Cruveilhier represents a case in which the stomach was filled to its utmost extent with reddish brown fluid blood. Budd observed a case in which not only the stomach but the whole intestinal tract was full of blood and the patient had bled to death. An interesting case is recorded by Finny.*

Sudden death of a young man, nineteen years of age, who was supposed to be suffering from phthisis and had had hectic fever for some time. There were no symptoms of disease of the stomach. Vomiting was absent up to the time of his death. The stomach and intestines as far as the anus were full of fluid blood. The stomach, diaphragm, pericardium, and cardiac muscle had grown together. A narrow channel-like communication opened into the left ventricle, the muscular wall of which was healthy with this exception, and had only undergone granular degeneration in the neighbourhood of the rupture. The ulcer was situated on the anterior wall of the stomach and measured 1¼ in. long by ¾ in. wide.

---

* Finny. Ulcus of the stomach opening in the left ventricle of the heart. Brit Med. Journ. 1886, 1, 1102.

In a case described by Powell [*] death was caused by a small aneurism of the coronary artery. The ulcer was situated on the lesser curvature close to the cardiac orifice, and in its centre was an aneurism the size of a pea, which, having burst and bled profusely, caused the death of the patient in a few minutes.

Hæmorrhage may appear, and has often been observed to do so, without any premonitory symptoms of *ulcus ventriculi*, thus coming under the fourth heading under which we have classed the different forms of the disease. As an example, I need only recall to your minds the case recorded at the beginning of this lecture. In this case, however, the fatal hæmorrhage was preceded by vague symptoms of a dangerous disease, in others, hæmorrhage, like a thunder-clap in a clear sky, has been known to put a sudden end to an apparently healthy existence. A case described by Poisson, [†] in which intestinal hæmorrhage appeared during convalescence from typhoid fever, and might have been mistaken for typhoid hæmorrhage, is interesting from a diagnostic point of view.

A serious complication of the disease, and sometimes of the symptoms, is caused by *perforation of the ulcer and the invasion of neighbouring organs.* When the ulcerative process has reached the outer layer of the wall of the stomach, and invades one of the neighbouring solid organs, among which I, in this case, reckon the coils of intestines, the process is sometimes announced by a feeling of pain in the organ affected, but more often there is no indication of the process, so that the functional disturbance of the organ in question first proves it to be affected. Or hæmorrhages from larger vessels may appear, particularly in the pancreas and omentum, which in the nature of the case are not distinguishable from the hæmorrhages already described.

I do not think that the possible eventualities, some of which have been already mentioned, are worth discussing in detail, although the literature of the last fifty years contains exhaustive accounts of them and of all the possible complications which may arise. By merely calling to mind the topography of the organs which surround the stomach, an insight may easily be gained into the processes in question. The most interesting among these is the invasion of the left ventricle of the heart through the diaphragm and pericardium with pneumo-pericarditis, or into the mediastinum with subcutaneous emphysema and accumulation of inflammable gases. Invasion of the pleural cavity may be diagnosed when it causes pneumothorax and purulent pleurisy or more direct communication with the lungs, when, as may, and does happen, particles of food are expectorated.

---

[*] Powell. Transact. Pathol. Soc. vol. 29, p. 133.

[†] Poisson. Bull. de. la. soc. anat. de Paris, 1855, Febr.

Invasion of the colon, causing "lientery," has been already discussed under the heading of perforating cancer. A curious development may result from perforation of the ulcer into the abdominal cavity. In favourable cases a process of adhesive inflammation goes on between the stomach, the neighbouring intestinal wall, and the omentum, by means of which a space is formed which represents a *saccus ad saccum* and hinders the passage of the stomach contents into the abdominal cavity. Symptoms of peritoneal irritation then appear, such as circumscribed pains and distension of the epigastric region combined with fever and frequent vomiting. Should the processes of adhesion be extensive, complete interference with the intestinal functions may result, which, as in the case described by Budd, may lead to permanent obstruction and increasing marasmus, and at times to death.

Rupture into the peritoneal cavity is by far the most frequent, either with or without previous adhesion and formation of abscess. The process may be slow and gradual, or rather the passage of the stomach contents may be retarded. In such cases circumscribed abscesses may be formed which become encapsuled, or burst later and produce general peritonitis. As a rule the rupture occurs quite suddenly without premonitory symptoms, or at least without symptoms which can be interpreted as such. Without any cause, or perhaps after an injury or chance blow, or after riding, sitting down suddenly, or leaning against a table or window-sill, or possibly as the effect of vomiting, the patient feels sudden and violent pains in the body, under which he becomes collapsed, and in a short time the symptoms of peritonitis are developed: distension of the abdomen, violent pains on the slightest touch, vomiting, singultus, facies hippocratica, small pulse, followed by death. But it may happen, as in the case described at the beginning of my lecture, that the rupture is not accompanied by any of these symptoms. In this case, the patient having gone for three days almost without food, the stomach contained neither air nor ingesta, in consequence of which the perforation was only accompanied by symptoms of extreme shock—unconsciousness, Cheyne-Stokes' breathing, *pulsus minimus, frigor cutis*, &c.—while the abdomen was neither violently distended nor very painful.*

Convulsive movements of the stomach may lead to rupture, whether they are produced by vomiting after medicine, or after passing the finger into the pharynx to vomit and bring up wind, as many patients like to do, or after the introduction of the sound. Faber† describes a case of rupture after voluntary vomiting. According to Bouilleaud‡ the act of defæcation, performed in the usual manner, has been known to lead to rupture.

Quite lately I had occasion to observe among the patients of a colleague a case of constricting pyloric ulcer with a perforation as large as a cherry stone. The perforation occurred in connection with washing out the stomach, which had been done at my recommendation the evening before, on account of extreme dilatation and retention of the stomach contents. The patient, who was miserably emaciated, complained immediately afterwards of violent pains and distension of the body, and died during the same night in a state of collapse. The autopsy made by me yielded the above-mentioned results, and I now submit to your notice the preparation obtained. The abdominal cavity contained free air and blackish brown stomach contents. The stomach is enormously dilated, the pylorus so narrow that a pencil will hardly go through it; the ulcer, about the size of a two-mark piece, is situated immediately above it, and has thick, wall-like (carcinomatous) edges, in the centre is the round perforation, with a smooth, sharply-defined contour, neither torn nor shreddy, and showing no sign of recent injury. Any direct lesion by the sound is out of the question, my colleague having made use of a soft india-rubber tube, and having manipulated in a thoroughly skilful manner, so that the explanation of the occurrence must be found in the traction of the stomach or abdominal wall, which washing out inevitably causes, and which, in this case, probably loosened a slight adhesion of the parts.

---

* Even unconscious persons react to violent sensations of pain.

† Faber. Emphysem des Mediastinums und der äusseren Haut in Folge einer Perforation eines Magengeschwürs. Württemb. med. Correspondenzbl., 1885, No. 40.

‡ Bouilleaud. Arch. de. méd. 1, p. 534.

I hardly need say that the experience thus gained only served to confirm my opinion of the extreme caution necessary in the use of the stomach tube.

Cases in which perforation of this kind is recovered from are extremely rare. There is no possibility of recovery in the proper sense of the word, for under the most favourable conditions, when the intestines adhere together again, the patient suffers from chronic ill-health and dies in a comparatively short time of increasing disturbances of nutrition. Sudden perforation has frequently caused suspicion of poison and given rise to false accusations.

The nature of the cicatrix is of great importance. It is evident that cicatricial contractions may lead to the most serious derangement of the functions of the stomach, one of which, dilatation of the organ after cicatricial stenosis of the pylorus, has been already discussed. In such cases well-defined, tangible symptoms are developed. In other cases cicatricial contraction leads to stretching of the nerves of the wall of the stomach, to distortion of the organ, to paralysis of large portions of the muscular wall, or to adhesion to neighbouring organs, and thus to gastralgia or functional disturbances which assert themselves in different forms of "dyspepsia," the original cause of which is difficult to discover, and for the most part impossible to cure. Patients of this kind are often supposed to be suffering from "nervous dyspepsia." Such cases are more common than one would expect, the history proving the existence of a former ulcer. When there is a formation of a pouch-like dilatation, and the stomach is washed out for any reason, the organ is apparently impossible to empty. The irrigation water does indeed run quite clear after a time, but then suddenly becomes again turbid with stomach contents, and this process may be repeated several times.* There is in such cases, either the condition just described, or an insufficiency of the pylorus which causes the duodenal contents to regurgitate into the stomach.

---

* This has also been noticed by G. Scherf, Beiträge zur Lehre von der Magendilatation. Inaug.-Dissert. Gottingen, 1879.

SYPHILIS AND ULCER.—As early as the year 1838 Andral asked why syphilitic symptoms should not appear on the mucous membrane of the stomach as well as on the mucous membrane of the mouth? Since that time the subject has been much discussed, and a number of more or less convincing observations have been communicated by Goldstein, Hiller, Virchow, Leudet, Lancereaux, Fauvel, Klebs, and Cornil. Only two cases of simultaneous appearance of a gumma with an ulcer of the stomach have been published. In other cases observed by Frerichs, Drozda, Murchison, and Chvostek cicatrices in the stomach were found simultaneously with generalised syphilis. Engel out of one hundred cases of ulcer observed a syphilitic process in ten, Lang found it in twenty per cent., while Julien in his important Traité des maladies vénériennes* expresses himself very guardedly, and is right in so doing. With two diseases, both so frequent as those we are now discussing, it can never be determined with certainty whether their simultaneous appearance is a question of cause and effect or a simple coincidence, especially as it is impossible in every case to exclude the chance of confusion with ulcerating gumma. In cases such as this the results of specific treatment can alone be decisive. Hiller† and Galliard‡ have both published several accounts of such cases, but the latter, who has written the latest monograph on the subject, himself acknowledges that they are not clearly proved. Specific symptoms are not proper to syphilitic ulcer. Still, it is advisable in cases of acknowledged syphilis, accompanied by the symptoms of ulcer of the stomach, to enter upon a specific course of treatment.

TUBERCULOSIS AND ULCER.—Tuberculous ulcerations of the intestinal canal are known to be common, but are not combined with ulcerations of the stomach to a corresponding degree, perhaps because the solvent gastric juice hinders the settlement of the bacilli, whether introduced through the blood or with the saliva which has been swallowed. The appearance of a solitary tuberculous ulcer of the stomach without any further affection of the digestive tract is rare (see above, page 448). The cases of this kind recorded in literature, some of which are open to doubt, have been collected by Marfan* in an essay on gastric derangements in phthisis of the lungs. There are no specific symptoms of tuberculous ulcer of the stomach. Sudden death from hæmatemesis has also been observed in this condition, in consequence of erosion of vessels.

---

* Paris, 1886, p. 880.

† Hiller, Monatsschr. f. prakt. Heilkunde, 1883.

‡ Galliard, l.c.

DIAGNOSIS.

Chronic ulcer of the stomach can be diagnosed with ease and certainty when the classical symptoms are present in their entirety, but should they be absent it can be only approximately diagnosed, or possibly it cannot be recognised at all. Two other diseases of the stomach, gastralgia or gastrodynia, a functional nervous derangement, and carcinoma, when it deviates from its typical course, may present a series of symptoms which bear an essential resemblance to those of ulcer. A comparison of the symptoms proper to each disease, such as has been already made by Walshe in his celebrated treatise on cancer, will serve to give you a good insight into the subject.

Nervous Gastralgia.	Ulcer.	Cancer.
The tongue varying, often pale and indented at the edges.	The tongue dry, red, with white central tracts, or smooth and moist, or slightly coated.	The tongue pale, covered with fur.
Frequent eructations, unaccompanied by smell.	Eructation rare, or acid eructation with heartburn.	Frequent eructations with an offensive smell.
No alteration of the taste in the mouth. The mouth as a rule dry, but salivation also is met with.	No alteration in the taste.	Pasty, insipid taste.
The appetite irregular and capricious.	The appetite good in the intervals of pain. Thirst.	Decrease or complete failure of appetite. Distaste for meat in the early stages.

---

* B. Marfan. Troubles et lésions gastriques dans la phthisie pulmonaire. Paris, 1887.

Nervous Gastralgia.	Ulcer.	Cancer.
Varying sensations in the stomach, sometimes of heat, sometimes of cold.	Burning in the stomach. Circumscribed, boring pains, often radiating towards the back.	Feelings of oppression, twitchings, and pains of different kinds, or pains in the shoulder.
The pain quite irregular, independent of eating, often alleviated by eating or by pressure on the stomach. Pressure point for the intestinal plexus.	Pains rare when the stomach is empty, generally brought on by eating, or by movements and positions which drag the stomach, worse on pressure.	Constant, dull pain, sometimes rising to paroxysms, generally produced or increased by pressure.
No essential change in the chemistry of digestion.	Digestion of starchy matter frequently retarded. Digestion of meat normal, or even accelerated; usually hyperacidity.	Digestion insufficient, as a rule absence of free hydrochloric acid, formation of products of decomposition.
Epigastric pulsations.	——	Epigastric pulsations only when there is extreme emaciation.
Vomiting uncertain, sometimes only mucus, sometimes more or less digested stomach contents, bile seldom brought up.	Vomiting generally, immediately, or at a short interval after eating, often the first symptom of the disease. Vomitus hyperacidus occurs very rarely with an empty stomach.	Violent and frequent vomiting, often at regular intervals, and sometimes on an empty stomach. Mucous; if acid, rendered so by organic acids. Always appears first in connection with other dyspeptic difficulties. Partially digested food, sometimes cancer cells.

Nervous Gastralgia.	Ulcer.	Cancer.
No hæmatemesis, except in rare, chance complications.	Vomiting of bright red blood, or coffee grounds material, generally repeated at short intervals, sometimes very profuse, with extreme anæmia and collapse. Comparatively quick recovery. Blood in the evacuation of the bowels.	More often disorganised than fresh blood. Quantity generally small; when once begun is generally repeated at short intervals.
Almost invariably more or less inveterate constipation. Normal action of the bowels very rare, sometimes watery, mucous evacuations, so-called pseudo-diarrhœa.	Action of the bowels irregular, not infrequently diarrhœa in consequence of irritation of the bowel. Lientery after perforation into the colon.	Inveterate constipation almost without exception. Lientery after perforation into the colon.
No fever.	Slight onsets of fever only when there is adhesive inflammation after eruption of the ulcer, or in connection with violent hæmorrhages.	Fever infrequent, and appearing first *sub finem vitæ*.
Colour of the skin pale, rarely healthy. Normal elasticity of the skin.	Generally a healthy colour, only anæmic after much loss of blood. The visible mucous membranes and even the cheeks are often slightly cyanotic. Another group of patients is chlorotic.	Earthy, yellowish colour, dry, loose skin. Extreme cachexia.
Often combined with hysterical symptoms. Common to every age, more frequent in women than in men.	Most frequent in middle age. Rare in children. Accompanied by unequal, often very depressed spirits.	Most frequent between the fortieth and sixtieth years. Spirits low and dejected, but to a marked degree less desponding than in severe cases of ulcer.

Nervous Gastralgia.	Ulcer.	Cancer.
No palpable tumour, apart from the exceptional cases in which foreign bodies (hair, &c.) have been introduced into the stomach.	When the ulcer is situated in the pylorus, with consecutive hypertrophy, there is a smooth, oval tumour to the right of the median line. Occasionally there is a palpable tumour in old ulcers which have a hard base and callous edges, or in cases of circumscribed encapsuled perforation or adhesion to the head of the pancreas, the left lobe of the liver, or the omentum. It is not moved by the movements of respiration. Hydrochloric acid present in increased quantities.	Tumour varying in size and shape, may be nodular or smooth, distinctly palpable, as a rule, movable from without, sometimes moving with the movements of respiration. In the majority of cases, no hydrochloric acid present. Secondary enlargement of the glands. Metastases.
No phenomena of perforation.	Perforation into the neighbouring organs accompanied by the characteristic symptoms, after an apparently short duration of the disease, or even without premonitory symptoms.	Perforation or invasion of neighbouring organs during the later stages of the disease only.

Gentlemen, I trust that the table just given will serve as a useful foundation for differential diagnosis. But however well defined the distinctions between the three diseases may appear on paper, in practice the most important symptoms are often absent, or if present, so confused or so indefinite in their manifestations as to render a certain diagnosis impossible. These remarks apply more particularly to the first stages of ulceration.

As long as these processes are confined to general disorders of the digestion, as long as typical gastralgic attacks are absent, and especially as long as there are no traces of hæmatemesis, we were formerly unable to distinguish these conditions from the great mass of dyspeptic diseases. Essential progress in the recognition of the disease has been made, and it is now possible to diagnose it during the early stages, by the proof of increased acidity, which I consider particularly important, although it must not be forgotten that exceptional cases occur in which this condition is absent. I have already, on page 425, communicated to you one case of this kind, a second may properly find a place here.

I present to you the patient in question, a gentleman forty-one years of age, who has repeatedly suffered from hæmorrhage from the stomach, and whose symptoms, together with the results obtained from examinations, remove all doubt as to the diagnosis of ulcer of the stomach. In consequence of repeated gastralgic attacks he came here about three weeks ago to undergo a course of Leube and Ziemssen's treatment by rest. His stomach contents have been examined three times, and the following results obtained: seventy per cent. of acidity on March 8th, fifty-eight per cent. on March 20th, and sixty-six per cent. on March 25th. You see here the filtered matter, five hours after a light dinner has been taken—I have intentionally chosen this form of test meal in order to show you that there is no difference between the test breakfast and dinner—we now triturate and obtain to-day, April 1st, sixty-three per cent. of acid.* Neither lactic nor fatty acid is present. Even if we allow the first estimation, seventy per cent., to be on the boundary line of hyperacidity, yet the others amount to far less, so you see, as I have already observed, that hyperacidity is not an essential attribute of ulcer, and that a negative result therefore must not be looked upon as diagnostically conclusive. These remarks are not intended to depreciate the value of positive results which Riegel has done good service in employing for diagnostic purposes, but nothing can give the same certainty as the classic triad of symptoms, typical gastralgia, hæmatemesis and bloody stools, absence of tumour, and no cachexia. I have, however, seen undoubted cases of ulcer in which the patient was extremely weak, and on the other hand cases of cancer of the stomach in which the strength was comparatively little impaired, and the general condition good. Sometimes, as Leube says, the diagnosis must depend upon the success or failure of a course of specific treatment for ulcer. A special diagnostic difficulty may be caused by the tumour-like cicatrices already mentioned, and by the neighbouring organs being involved in the base of the ulcer to which they have adhered, and by which they are being perforated. The head of the pancreas and the left lobe of the liver are often affected in this way, the omentum more rarely. There is also a lymph gland in the ligamentum gastrocolicum, or rather a chain of glands lying close together, which under certain conditions undergoes sympathetic swelling, becomes sensitive on pressure, and may be felt at the lower edge of the stomach as a collection of small tumours the size of hazelnuts, which has often led me into serious diagnostic difficulties. In all these cases aids to a correct diagnosis of ulcer in contradistinction to cancer are furnished by the presence of hydrochloric acid, by the preservation of the patient's strength, and by the fact that the tumour does not grow, added to which our previous statements with regard to the length of this process show that the continuance of the disease for more than three years, and the absence of typical cancerous cachexia, speak strongly in favour of ulcer.

---

* Another examination was made on November 1st, which showed forty-six per cent. of acid.

Gentlemen, after all that we have said the important question urges itself upon our notice, whether it is under any circumstances justifiable and necessary to use the stomach tube in cases of ulcer of the stomach? You know that up to a very recent date the answer was decidedly in the negative, and that some clinicists, Leube for instance, still adhere to this maxim, but it is the fashion at present to be far less cautious in the use of the tube. It cannot be denied that the danger of causing injuries is considerably diminished by the use of soft tubes and by previously painting the pharynx with cocaine, still it is not quite removed, and if you consider how liable patients, who are most accustomed to the use of the tube, are to choke or vomit during the operation, and if you recall to mind Faber's case and mine quoted above, you will, I am sure, agree with me that examinations with the tube should be made with the utmost precaution. Germain Sée,* one of the first clinicists in Paris, rejects the use of the tube in cases of gastric ulcer, and quotes cases from Cornillon and Daguet, in which "lavage" was followed by fatal hæmorrhages. In hospital or in medical establishments where all the necessary appliances are at hand the risk may perhaps be run in the interests of science and for the sake of the benefits to be obtained, but in private practice or amongst out-patients I must expressly warn you against it, and express my opinion that it should only be done where there is no other means of diagnosis. It might happen to any one of us that the introduction of the tube might cause hæmorrhage, or by an unlucky chance even perforation of an ulcer which had hitherto been latent, or accompanied only by indefinite symptoms. This might easily have happened to me in the case quoted at the beginning of this lecture, without any just cause arising for self-reproach either in this case or in the one mentioned later. This danger should always be borne in mind. It is indeed reduced to a minimum, if in suspicious cases the pharynx be painted with cocaine before the introduction of the tube, and the ball or stomach pump used with the utmost possible care, the danger being under these circumstances equalled or outweighed by the great advantages in other respects possessed by our method. Nevertheless, for the reasons given above, I abstain from the use of the stomach tube in all cases of ulcer in which a diagnosis can be made in any other way, and do so all the more readily, as in these cases the examination of the stomach contents is not diagnostically decisive, and no aid can be obtained from it for treatment. Curiously enough washing out the stomach may be of great use in severe and otherwise uncontrollable hæmorrhage. I have since seen cases, in which ergot and perchloride of iron had failed, cured by the use of repeated washing with ice-cold water.

It is, as I mentioned before (p. 452 et seq.), sometimes difficult to obtain those proofs of hæmatemesis or melæna which are necessary for making a diagnosis. I must here mention an apparently trifling circumstance, which, however, has an important influence on the opportunity of observing the alvine evacuations, namely, the use of the water-closet. Many patients, except when they are in bed, know nothing of the nature of their excrement beyond the vague feeling that it is hard or soft, abundant, sufficient or insufficient, because they have no opportunity of seeing it. For this reason it is impossible to ascertain, among other things, whether the evacuation has been accompanied by hæmorrhage. The following is a striking instance taken from my case-book: A gentleman thirty-eight years of age had suffered for five years from disordered stomach, which at first only revealed itself in fulness after food, occasional eructation and constipation. Little improvement was effected by strict diet and medicines, combined with drinking Carlsbad (Mühlbrunnen) waters. Cardialgia proper was never present. A year ago he had at his office an attack of diarrhœa and abdominal pains which obliged him to go to the closet several times during the day. In the evening he suddenly collapsed and fainted away, and was carried home half dead. He remained in bed for five weeks and recovered slowly. During the course of the next summer he became quite well, only suffering from slight pains in the stomach. For about eight weeks there has been a return of serious symptoms, that is to say, violent eructation and repeated vomiting some time after eating, particularly in the night between ten and twelve and two and three o'clock. After vomiting he felt better. Blood has never been found either in the vomit or in the evacuation of the bowels. Constipation, great weakness.

---

* G. Sée. Hyperchlorhydrie et atonie de l'estomac. Bull. de l'acad. de méd. 1, May 1888.

No objective symptoms were found except a slight sensitiveness on pressure in the scorbiculus and to the right of it in the parasternal line under the costal arch. The test breakfast showed an acidity of eighty-four per cent., thus proving the existence of hyperacidity.

There can be no doubt that, other conditions which lead to intestinal hæmorrhage (tuberculosis, tumours, and diseases of the liver or portal vein) being excluded, this was a case of ulcer of the stomach or duodenum, and that the so-called diarrhœa was nothing else than profuse hæmorrhage from one of these organs which led to unconsciousness. The patient had a vague recollection of having observed traces of blood on the paper in the water-closet. How often must hæmorrhages of this kind occur, without leading to such serious consequences and without coming to the knowledge of the doctor! I recently met with another case of this kind, a gentleman suffering from gastralgia, who, after a short stay at Carlsbad, had two severe fainting fits, which, judged by the light of after events (the symptoms of duodenal ulcer being more clearly developed in the course of time), could only be attributed to severe internal intestinal hæmorrhage.

Considerable diagnostic difficulties may arise in distinguishing between *hepatalgia and gastralgia* resulting from pyloric or duodenal ulcer. This is of course not the case when either disease is typical; constantly recurring pains in the right hypochondrium unconnected with eating, slight onsets of fever, jaundice, swelling and pains in the liver, a palpable gall bladder or stones and their passage, make a diagnosis of hepatalgia as certain as that of ulcer is by the above-mentioned symptoms, but numerous cases occur in which the symptoms are so confused that it is almost impossible to distinguish between the two diseases. In hepatalgia jaundice is sometimes absent, or is present in a very slight degree; and on the other hand, it is not uncommon to find cases of gastralgia accompanied by slight jaundice, which is caused either by the convulsive contraction of the abdominal organs pressing the bile into the blood-vessels, or by a transitory sympathetic spasm of the hepatic duct which produces biliary engorgement. Patients suffering from either disease often feel most pain in the neighbourhood of the median line, and this is especially the case with women in whom the use of stays has altered the position of the liver. If the pylorus is pushed a little to the right, or if the ulcer should be in the horizontal branch of the duodenum, there is no possibility of distinguishing them by position. Thus it may be doubtful for some time, or perhaps for ever, whether the patient is suffering from gallstone or from gastralgia. Hyperacidity of the stomach, should it be present, is a valuable aid to diagnosis. Acidity amounting to over 80, that is to say, 0·3 per cent. HCl, may be looked upon as hyperacidity.

The diagnosis, however, should not be confined to the existence of an ulcer, it should also ascertain its position. This claim has often been put forward, and most recently by Gerhardt. Is it possible to satisfy it? According to my conviction and experience, only in the cases in which an exceptionally favourable combination of symptoms allows of the recognition of ulcer in the pylorus or duodenum, or occasionally in the greater curvature. It is possible too to guess *per exclusionem* that the ulcer is situated elsewhere. A pyloric ulcer may be recognised by a fixed pain slightly to the right of the median line. But the time at which the pain comes on fails to throw any light on the subject, for I consider the assertion that ulcer of the cardiac portion of the stomach is accompanied by pain during the act of eating, while pyloric ulcer causes pain afterwards, to be neither sufficiently vouched for clinically nor borne out by the facts of the case. We have no reason to suppose that the ingesta are retained at the cardiac end and only reach the pylorus a considerable time afterwards. Attempts have also been made to ascertain the situation of the ulcer by the position which many patients take to obtain relief from pain. If the pain be less when lying on the left side, the ulcer is said to be on the lesser curvature, and *vice versa*. But this too is a doubtful and uncertain symptom, especially as the majority of patients do not experience these differences. If we could discover at what part of the stomach the ulcer is situated it might be of practical use for prognosis. According to Gerhardt* "sensitiveness on pressure and swelling go to prove that the ulcer is on the anterior wall, pain in the back and hæmorrhage speak for the posterior wall. The situation of the pain and its increase when the patient lies on his side often serve to distinguish between ulcer of the fundus and ulcer of the pyloric region. Ulcer of the fundus adhering to the omentum may lead to splenitis and to rigors, as I (Gerhardt) have observed in three cases." It is hardly necessary to say that dilatation of the stomach is in favour of the position of the ulcer at the pylorus or duodenum, while its contraction points to the cardiac orifice. But if you consider how vague is the symptom of sensitiveness to pressure, how rarely swelling caused by ulcer appears in comparison with the cases in which it is absent, how little able we are to diagnose contraction of the stomach *intra vitam*, and if you recall to mind the case quoted on page 387 of perforation of a disintegrating carcinoma of the lesser curvature accompanied by rigors, and finally if you consider how common it is for several ulcers to be situated in different places, you will form a right estimate of the untrustworthy nature of these symptoms. I cannot agree with Gerhardt's dictum that "the diagnosis, in order to be certain, must define the situation of the ulcer," but for the most part confine myself to the simple diagnosis of ulcer, which, under certain conditions, is no easy task.

---

* l.c.

What I have said with regard to the position of the ulcer in the stomach applies also to its position in the duodenum, for in at least ninety per cent. of cases it is impossible to decide whether it is in the stomach or in the duodenum. In this respect the duodenum, and particularly its horizontal portion, must be looked upon simply as an addition to the stomach, the ulcerative process being accompanied by the same symptoms in both parts. Those symptoms which would lead to the diagnosis of pyloric ulcer appear with equal frequency in duodenal ulcer, more particularly as the ulcerative process sometimes extends directly from one part to the other. The ulcer is probably in the duodenum, if the pains only come on some time after eating, if they, together with a dull sensitiveness on pressure, are situated decidedly to the right of the parasternal line, and finally if there be much blood in the motions without hæmatemesis. It is useful for diagnostic purposes to remember that duodenal ulcer often appears after extensive burns of the skin. A certain, though very slight assistance is rendered by the fact that duodenal ulcer is rare, appearing, according to Willigk, six times to two hundred and twenty-five cases of ulcer of the stomach, while Trier gives the proportion as twenty-eight to two hundred and sixty-one. But even this small percentage includes cases in which the ulcer appeared both in the stomach and duodenum. Budd believes gastralgia to be less frequent, because the duodenum is less exposed to dragging and changes of position than the stomach. The rare occurrence of icterus in duodenal ulcer is as of little value for diagnosis as the fact that intestinal hæmorrhage is more frequent than hæmatemesis, because ulcer of the stomach leads to intestinal hæmorrhage also, and duodenal ulcer is sometimes accompanied by hæmatemesis.

PROGNOSIS.

Gentlemen, up to within a very recent period ulcer of the stomach, which could only be diagnosed by means of the old conventional methods, offered a very uncertain field for prognosis. Now that we are in a position to recognise it in its earlier stages and to distinguish it from other dyspeptic diseases, now that we understand the principles upon which it should be treated, and are able to apply that treatment early, the prognosis, at least in these early stages, has become much more favourable. We may hold out good hopes of cure to the patient who is willing to submit to rational treatment, that is to say, treatment by rest, and even in the cases of classical ulcer, cure, or at least considerable improvement, may be looked for. Unfortunately few patients are willing or able, in the first stages, in which they feel comparatively little pain and discomfort, to submit to a course of treatment which certainly makes large demands on their time and patience. But if we once succeed in permanently removing the abnormal constitution of the blood or of the gastric juice, the danger of relapse is also removed, which otherwise threatens constantly and occurs only too often. But ulcer, more particularly when it is extensive, always leaves dragging cicatricial formations which cause permanent and incurable injury to the physical condition of the patient. In such cases the prognosis must be made with the utmost caution. The well-known fact that cicatrices from ulcers of the stomach are found about twice as often as uncicatrised ulcers, proves that the prognosis is not very unfavourable in any case. It is usually favourable in hæmorrhages, unless they are fatal at once. With proper treatment the hæmorrhage may generally be stopped, and the patient recovers in a comparatively short time even from extreme anæmia.

TREATMENT.

Gentlemen, I know of only one method of treatment for ulcer of the stomach which holds out reasonable hopes of success, and which, if undertaken sufficiently early, has been known to produce the most favourable results. This is the method of treatment by rest, lately introduced into Germany by von Ziemssen and Leube,* the principle of which is that the stomach is protected from every cause of irritation, in the same way as a broken bone is protected by a plaster of Paris bandage, only with this difference, that absolute quiet is possible in the latter case, while in the former condition rest only can be obtained. Confinement to bed, nourishment *per rectum*, or with food which makes as few claims as possible on the stomach, form the fundamental principles of this method of treatment, which was recommended in England some time ago by Wilson Fox and Balthazar Foster.† As adjuvants we may use anodynes and means to allay irritation, moist heat externally in the form of fomentations, and employ internally hot Carlsbad water or a solution of Carlsbad salt.

---

* V. Ziemssen. Ueber die Behandlung des Magengeschwürs. Volkmann's Samml. No. 15; Leube, Magenkrankheiten, p. 117.

† L.c. p. 944.

Gentlemen, I could quote a great number of cases in which patients have been completely cured, or at least relieved for a length of time. The following will serve as an illustration:—

Mrs. Fr., thirty-seven years of age, consulted me privately in October, 1888. Symptoms of typical ulcer, hæmatemesis, gastralgia. The patient suffered from violent pains after eating, and sometimes during the night or in the morning when the stomach was empty. She had been very strictly dieted, and was weak and emaciated in consequence; she looked pale and miserable. There were pains in the pit of the stomach on pressure. No tumour. The abdominal walls were relaxed, but violent muscular contraction took place on pressure in the above-mentioned part. No movable kidney. The urine was healthy. The patient is a widow, and supports her family by working with a sewing machine.

She was at first treated with a course of internal remedies, argent nit., bismuth, with ext. hyoscyam., morphia, laudanum, &c., which was continued without success till the middle of January, 1889, slight improvement being immediately followed by a return to the original condition. On the 14th of January she was admitted into the Augusta Hospital, where she was put under the regular treatment for ulcer which I am about to describe. A marked and permanent improvement immediately took place in her condition, the sensitiveness to pressure in the scorbiculus ceased, a symptom to which I attach great importance, and at the end of six weeks, on the 20th of February, the patient was sent away cured. As she was very imprudent, and during her convalescence disobeyed the orders which had been given with regard to diet, in consequence of which she suffered from a renewed attack of gastralgia, she may be looked upon as a brilliant example of the success of the treatment. Up to the present time there has been no relapse.

I must not, however, conceal from you that the process of cure is not always so quick, and that I have had patients whose condition was highly satisfactory so long as they continued under treatment, but who, in spite of the utmost precaution, suffered from a return of the old difficulties as soon as they returned to their usual manner of life. But such cases are decidedly in the minority.

Leube lays stress on the neutralising effect of the combination of Carlsbad salts, which is also stimulating in consequence of the common salt contained in it. But this latter must be looked upon as a disadvantage now that we know that in the majority of cases acidity is increased, and that a depressant is therefore required rather than a stimulant. Neither can I attach any great importance to the neutralisation or modification of the acidity, if it only takes place once, and that at a time when no food has been taken, and when, unless secretion is persistent (hypersecretion), the stomach is empty. The essential point seems to be the diminution of hypersecretion produced by the use of a neutral salt, which was suggested by Pemberton, and directly proved to occur by Jaworski,* together with the soothing effect of large quantities of warm water and the aperient effect of the neutral salt, and if alkaline waters prove less effective than alkaline-saline waters it is merely because the purgative effect of the latter has not been attained by other means.

If this purgative effect should fail, as is often the case with Carlsbad water, it must be supplemented by Glauber salt, or better still, by vegetable aperients, among which rhubarb or infusion of senna are most to be recommended. We need not adhere too strictly to the letter if the essential principles be observed. It is immaterial whether the pain be relieved by warm fomentations, or when these are not sufficient, by injections of morphia, or whether a solution of mineral salt or the natural waters of Carlsbad, or an alkaline carbonate, for instance, Ems, Vichy, or Neuenahr waters, be taken, and the defective action of the neutral salts supplemented by other aperients. From 300 to 500 ccm. (10 to 16 oz.) of Carlsbad water should be taken. From which spring? This is immaterial, because there is no essential difference in their chemical composition, and the difference in temperature of the various springs is equalised by the fact that all are taken as hot as the patient can bear. Fifteen grms. (one tablespoonful) of salt should be taken in half a litre of water, and should be sipped at intervals in the way that mineral waters are taken. I prescribe complete abstinence for the first three days, only giving a nutrient enema three times a day. After that we begin with nourishment *per os*, first giving small quantities of milk gruel,* then vegetable soup, lentils and mashed potato, to which small quantities of pounded meat should eventually be added. Not till the end of three weeks should a more generous diet both in quantity and quality be allowed, but care should still be taken to give as little work as possible to the stomach. This diet no doubt weakens patients and causes them to decrease in weight, therefore great care in the treatment of different individuals is necessary. But they generally recover quickly, there is no return of gastralgia, and now is the time to attend to the second indication for treatment, that is to say, the strengthening of the constitution.

---

* Jaworski. Ueber Wirkung therapeutischer Werthe und Gebrauch des neuen Carlsbader Quellsalzes. Wiener med. Wochenschr. 6—16, 1886.

For this purpose preparations of iron must be used, either alone or combined with arsenic, alone if it be a case of simple chlorosis and anæmia, with arsenic if the nervous system be weakened, and it is desirable to strengthen it indirectly by stimulating assimilation. Physicians formerly hesitated to prescribe iron in cases of gastric ulcer on account of the idea that it is not well borne during the course of an inflammatory process, but there can be no excuse when retrogression has commenced and is in full train. I, at least, fully concur in the favourable opinion which Te Gempt † has published as the result of his experience on the subject. He makes use of liq. ferri album. Drees, a preparation obtained by a mixture of albumen with perchloride of iron, which is somewhat expensive if bought at a chemist's shop. As, however, the only thing necessary is to supply the stomach with albumen and iron in due proportions in order that iron-peptone capable of absorption may be formed, and as it has been proved that in gastric ulcer the power of forming peptone has not been destroyed, I prescribe this medicine in a simpler and cheaper form, that is to say, I order a 2 to 3 per cent. solution of ferri perchlor., of which a teaspoonful is to be taken three times a day in a wineglassful of albumen solution (1 part white of egg, 2 parts water) to be sucked through a glass tube in order to avoid injury to the teeth. Much has been said in praise of perchloride of iron as one of the mildest and most easily assimilated preparations of iron, and I fully agree with it all, but, gentlemen, it is well known that every one has his special favourite among the different preparations of iron, and if you prefer any other and have seen good results from the use of it, do not let me persuade you to alter your opinion. The preparation itself is not the important point, but its absorption and the effect produced on the blood. I formerly used arsenic in the form of Fowler's solution with tinct. ferri perchlor., but Liebreich's exposition has convinced me that the acid is more suitable for the purpose, and I now prescribe it in the form of pills, acidi arsenici 2 mgrms. and ferri perchlor. 2 cgrms. In this case too it is advisable to gradually increase the doses, and to order the pills to be taken after meals. This regimen must be continued for months, the use of the medicine being interrupted by an interval of three to five days once in every three weeks. If caution be thus used and the arsenic given in increasing and decreasing doses, varying from three to ten pills per diem, arsenic and iron may be taken together for a length of time. Dietetic regulations may gradually become less strict, but must not be altogether relaxed for many months, and patients who are inclined to be imprudent should be weighed at regular intervals and confined to a written bill of fare to insure obedience to orders.

---

* Cruveilhier recommends a milk diet to begin with. Gruel made with milk is, however, preferable, because the casein forms smaller curds when the milk is mixed with other ingredients than when it is taken alone.

† Te Gempt. Ueber Behandlung des runden Magengeschwürs mit Eisenalbuminat. Berl. klin. Wochenschr. 1886, p. 240.

The result of this method of treatment is a brilliant confirmation of the truth of Leube's statement that "the treatment of ulcer of the stomach offers great opportunities to the physician as a very large majority of cases are cured, especially if those cases be counted in which the patients are completely relieved for a length of time and only suffer from relapse in later life"*; and in another place he says, "I am convinced that the more strictly the dietetic regulations are carried out during the time that the patient is confined to bed, the less necessity there will be for the use of medicines in cases of ulcer of the stomach."

But in spite of all this we cannot do entirely without medicine. For one reason, because many patients are unable or unwilling to submit to such a course of treatment, and for another because in many cases it is important to fulfil strictly the *indicatio symptomatica*.

Bismuth has been a favourite remedy with physicians ever since it was first recommended by Odier in Geneva, although the great variety in the quantities prescribed (from 1 dgrm. to 15 grms.) shows that no very clear idea has yet been formed with regard to its effects. Odier prescribed it to be taken "intérieurement comme antispasmodique," while the English school afterwards made use of it to correct an "undue secretion," and in our own day the curious theory has been advanced that the comparatively minute quantities of the preparation introduced into the stomach settle on the surface of the ulcer and form there a protective covering. As it is generally prescribed in Germany in proportions of 0·5 to from 5 to 10 grms. of morphia it is impossible to tell how much of the effect is attributable to the latter. The French method of prescribing large quantities, from 10 to 15 grms., to be taken in water, seems to me the most sensible, but this is not possible in every case on account of the expense.

---

* Leube. Magenkrankheiten, p. 113.

Gentlemen, bismuth has been recommended by so many leading practitioners with such good results in cases of gastralgia—Budd recommends it especially for "gastralgia with increased secretion of gastric juice"—that all possibility of a mistake would seem to be excluded, but in spite of this the question remains to be decided whether it possesses any specific efficacy, or whether it might not be replaced by another preparation of an alkaline sparingly soluble salt such as carbonate of lime.

These remarks apply also to a very great extent to nitrate of silver. In this case too we are quite in the dark with regard to the manner in which it affects the stomach, for, as Leube has pointed out, no one believes in the direct local effect of small doses of nitrate of silver—0·01 for a dose—and it is equally impossible that a completely acid combination can be everywhere produced by it. Nevertheless great authorities, among whom I will only mention Gerhardt, have spoken in favour of the good effects of this drug. In some cases I have obtained even a complete cure from the use of a solution of 0·2 argent. nitric. with 150 water, taken every two hours; in others I was obliged to discontinue the use of the medicine after a short time, as it caused increased discomfort in the stomach, nausea, anorexia, foul tongue, disordered bowels, diarrhœa, or constipation. In one of my cases liquid motions followed each dose of the mixture.

In my opinion the principles stated above also hold good with regard to treatment when the patient leaves her bed, and I attach the utmost importance to a strict adherence to them, particularly to those concerning diet. In such cases milk is specially important, the effect of which in combining with acids is well known, and has lately been placed beyond doubt by the experiments of Leo and von Pfungen. Unfortunately many people cannot take milk in any form, even with the addition of soda, lime water, cognac, or coffee. In such cases peptonised milk mixed with cream to improve the taste (which is sold in Berlin as "Voltmer's mother's milk") can be often taken. I also endeavour to correct the hyperacidity of the gastric juice by small doses of alkali mixed with rhubarb and cane sugar or sugar of milk, to be taken every hour. Rhubarb has a mild effect on the intestines, the sugar soothes the pain, and is often recommended for this purpose. I prescribe a powder, the good effects of which I have often observed, composed of the following ingredients: ℞. magn. ust., sodii carb., potassii carb., ana 5·0, pulv. rad. rhei 10·0, sacch. lactis 25·0, of which as much as will go on the end of a knife should be taken dry every hour. The best remedy for violent gastralgia is morphia, either injected or taken internally. Solutions of chloroform (1 : 120, one tablespoonful to be taken every two hours) sometimes have a very good effect, not only on the pain but also on the course of the disease. I have made experimental use of other anodynes, such as lupulin, ext. cannab. ind., ext. hyoscyam. and belladonna, but have always been obliged to return to the use of morphia. Leeches were formerly often applied to the affected part, as well as blisters and even the cautery iron, but we content ourselves now with the ice-bag or with the application of ice-cold or warm fomentations, or of Leiter's coil, which is, when circumstances allow of its use, the cleanest and most convenient form of cold application.

No remedy is so good for vomiting as carefully regulated diet. Large quantities of warm water may be taken several times a day, as well as small pieces of ice with chloroform. But as vomiting generally disappears when the gastralgia ceases, the remedies employed for one symptom affect the other. Special attention should be paid to hæmatemesis, not only when it is profuse, in which case attention is paid as a matter of course, but also in cases of slight hæmorrhage. Absolute mental and bodily rest should always be insisted upon, the avoidance of all internal and external irritation to the stomach being the first necessity. If possible the patient should be subjected to this treatment for several days, and every means of treatment brought into play, because slight hæmorrhages are often merely the precursors of more violent attacks of the same kind. Small pieces of ice, iced tea, and an iced solution of peptone are taken by the tablespoonful. Unless I know that the patient can take milk I do not give it in such cases, but prescribe for the first day either a solution of grape sugar mixed with a little meat-peptone broth to be taken iced, or cold oatmeal gruel, or barley water, and when circumstances permit I also cautiously introduce nutrient enemata. A preparation of 2·5 ext. secal. cornut. to 5 each of water and glycerine should be made and injected all at once or by degrees into the gastric region, this injection being repeated several times a day; I must however call your attention to the fact that ergotin produces very unpleasant sensations of oppression and giddiness in some persons. If the patient is greatly excited the injections of ergotin should be combined with small injections of morphia, after which the hæmorrhage will probably not proceed from very large vessels. Formerly acetate of lead, perchloride of iron, and oil of turpentine were used internally, and these remedies, which we now no longer require, ergotin being far more effective and more rational, were held in honour on account of their styptic qualities. If collapse occurs, injections of camphorated æther (1 : 6), enemata of wine, or wine mixed with egg or peptone, and hot fomentations to the extremities should be prescribed. In cases where there is danger of bleeding to death, with a very small pulse, hæmic murmurs over the heart and anæmia of the brain, recourse must be had to transfusion of blood or injection of a solution of common salt. The advantages of both methods have been much discussed without at present any satisfactory conclusion having been reached; a large and increasing number of cases, however, have lately been successfully treated by the injection of common salt solution.*

Peritonitis caused by perforation calls for the use of opium in large doses, either in the form of suppositories or enemata, together with the application of cold fomentations to the abdomen. If there is cause to suspect that the stomach is full, an attempt may be made to empty it by means of the tube, the danger of struggling being first as far as possible removed by a strong dose of morphia or by painting the pharynx with cocaine, but the greatest care should always be taken to prevent violent chokings, which must eventually enlarge the perforation. Sometimes when the above-mentioned course of treatment has been followed, the peritonitis has been localised and adhesion produced.*

---

* For instance Michaelis, Heftige Magenblutung nach einer Magenausspülung (wahrscheinlich bei Ulcus). Erfolgreiche Kochsalztransfusion. Berliner klin. Wochenschr. 1884, No. 25.

I must also mention that ulcer of the stomach may be treated operatively, and has been successfully excised by von Kleef among others. The future must decide how far this method of treatment, the chief difficulty of which is created by the uncertain position of the ulcer in the stomach, can be removed from the regions of chance and carried to a definitely successful issue.

In conclusion I must express my opinion on the subject of treatment at watering-places.

Hot Glauber salt springs, especially those of Carlsbad, have long enjoyed a high reputation, and there is no doubt that the treatment of ulcer in these places is attended with the best results. It is also impossible to say, as is sometimes done in the case of other affections and other places, that a cure would have been worked without the help of Carlsbad waters, but in spite of this I am of opinion that the same good result, and perhaps an even quicker cure is produced by a course of treatment by rest at home, followed by a visit to a place with bracing air where a tonic regimen is observed. For the advantages connected with a visit to mineral springs, good air, amusement, and beautiful scenery, which are often so effectual in promoting cure, are not necessary in cases of ulcer of the stomach. What is necessary is rest and appropriate local treatment, which may be had better at home than anywhere else. When the derangement of the digestive apparatus is once removed it is time enough to prescribe a visit to Franzensbad, Elster, Rippoldsau, or Pyrmont, or to the sea-side, or the mountains, in order to improve the general health of the patient, provided always that suitable food can be procured, to ensure which it is best for the family to take their own cook and establishment with them. For this purpose watering-places on the Baltic, which offer every opportunity for private housekeeping, are very suitable. But as many patients make up their minds to a course of treatment by mineral waters much more readily than to one of rest at home, and as many too can only devote the short space of a month or six weeks to the process, Carlsbad is the best place for them, if only for the reason that dietary indiscretions are almost impossible there. After Carlsbad I should recommend Neuenahr, Ems, Franzensbad, and Homburg.

---

* Cases of this kind which have been proved by means of the subsequent perforation of a second ulcer and by the results of a post-mortem examination are recorded by Hughes, Hilton and Ray, Guy's Hosp. Rep. vol. 4; and by Bennett, Clin. Med. p. 487.

APPENDIX.

HÆMATEMESIS.

Gentlemen, in connection with hæmatemesis in ulcer and cancer of the stomach, which diseases undoubtedly most often give rise to this symptom, we will discuss the rarer causes which lead to hæmorrhage from the stomach.

The symptoms of hæmatemesis have been stated in detail on page 452 et seq., so that it only remains for me to mention two occurrences, namely, œdema of the extremities, which shows itself particularly in the evening when the patients have stood about during the day, and amaurosis, which appears either immediately or a short time after the hæmorrhage, and which, according to Fries,[*] occurs in 65·5 per cent. of all cases of hæmorrhage in the intestinal tract, but the precise connection of which with hæmatemesis has not yet been clearly explained.

But as the term "vomiting of blood" does not mean only hæmorrhage from the stomach or the tractus intestinalis including the œsophagus but also from the lungs, it may be well to distinguish accurately between the two, that is to say, between hæmatemesis and hæmoptysis. As a rule this distinction is easily made. We must remember that in hæmoptysis the blood is largely mixed with air and is therefore of a bright red colour, that it is expectorated in fits of coughing, and also that the history of the case points to a chronic lung disease. In many cases the patients themselves feel distinctly whether the blood comes from the lungs or from the stomach, an attack of the former being preceded by irritation in the throat, causing cough and a feeling of warmth in the thorax, the latter by nausea and irritation, which leads to vomiting. This is the case also with pharyngeal hæmorrhages, besides which they are usually not abundant, their source is for the most part easily discovered, and the attack comes on under conditions which do not admit of mistake. An attack of hæmatemesis may, however, be very violent, the aspiration of blood into the respiratory passages may lead to coughing, and blood may be ejected through the nose as well as through the mouth. In this way the case may assume a deceptive appearance of hæmoptysis, and a suffocative attack may even be produced, if clotted blood remains in the pharynx while the patient is unconscious. Henoch[*] states as a differential symptom, apart from the ultimate evidence of lung disease, that in hæmatemesis the blood serum has an acid reaction, while in hæmoptysis the reaction is alkaline. I have no experience on this point, but for self-evident reasons cannot accept the statement in cases of violent hæmorrhage quickly followed by vomiting. The condition after the attack is far more important as an aid to differential diagnosis. In hæmoptysis the patients cough for a length of time, and expectorate brownish or reddish brown nummular sputa; when the attack is renewed the blood is first bright red, then afterwards darker in colour. There is no expectoration after hæmatemesis, but so-called melæna, that is to say, blood in the evacuations of the bowels instead, which in doubtful cases may be taken as a symptom of hæmatemesis, although we must not forget that hæmatemesis often takes place without intestinal hæmorrhage, while, on the other hand, in hæmoptysis blood is occasionally swallowed and passed with the fæces. The causes which, apart from carcinoma and ulcer of the stomach, lead to hæmatemesis are the following:—

---

[*] S. Fries. Beiträge zur Kenntniss der Amblyopie und Amaurose nach Blutverlusten. Inaug.-Diss. Tübingen, 1876.

1. *Obstructed conditions in venous vascular areas.* Dr. Yellowly[†] communicates a case of hæmorrhage in the stomach (of course not leading to hæmatemesis) in a person who had been hanged. Similar results are said to accompany epileptic attacks. Cases of hæmatemesis in heart disease are described by Carswell and Budd,[‡] and Handfield Jones[§] mentions one in acute yellow atrophy of the liver, and another in cirrhosis of the liver and compression

---

[*] Henoch. Klinik der Unterleibskrankheiten, p. 432.

[†] Med.-Chirurg. Transactions, 1853.

[‡] l.c. p. 53.

[§] H. Jones, Cases of hæmatemesis with remarks. Med. Times and Gazette 1855, 2. pp. 182 and 410.

31

of the portal vein. Debove * has published a very interesting paper on the connection between hæmatemesis and diseases of the liver, and the same facts have been insisted on by Blums of Copenhagen, Litten, Saundby, and Wilson. Hæmatemesis is also said to have been observed in intermittent fever, but in the cases described the non-existence of ulcer has not been proved.

2. *Active hyperæmia.* The oft-quoted case of Watson † of a woman who from the time that she was fourteen years old had hæmatemesis instead of the catamenia, which only ceased after her marriage, during the time of pregnancy and lactation, and afterwards returned in its accustomed manner, is an example of this. I saw a curious case of a lady who to procure abortion drank a decoction of red wines, spices, chamomile, juniper, &c., and used vaginal injections of hot water. The unexpected result was that she had two attacks of hæmatemesis in twenty-four hours, but failed to effect her purpose. In this category too must be classed hæmorrhages in extreme cases of chronic glandular gastritis, which are analogous to hæmorrhages in chronic catarrh of the nose and pharynx, but which are usually too slight to produce hæmatemesis. The rare cases of hæmatemesis in hysteria, hæmatemesis in cholera, yellow fever, scurvy, and purpura hæmorrhagica, unless they proceed from direct lesion of the vessels, that is to say, alteration in the walls of the vessels, must also be placed in this category.

3. *Direct traumatic injuries.* Hafner describes the case of a boy who, falling from a considerable height on to the hard ground without apparent external injury, had, half an hour afterwards repeated attacks of hæmatemesis and bloody motions.‡ Sha objects which have been swallowed, and even violent vomiti without any further injury, may cause hæmatemesis.

4. *Alterations in the walls of the vessels.* Nothing is at prese known about the formation of varices, or about the atheromato or waxy degeneration of the gastric vessels which leads hæmorrhage. Venous varices of the œsophagus in old people in chronic alcoholism (Letulle) may also cause pseudo-hæmateme

---

* Debove. Des hémorrhagies gastro-intestinales profuses dans la cirrhose d foie et dans les autres affections hépatiques. Journ. société anat., 1890, No. 43

† Quoted by Budd, l.c. p. 364.

‡ Quoted by Henoch, p. 434.

sis. Two cases of this kind are mentioned by Gallard,* in which small aneurisms the size of a millet-seed produced very profuse hæmorrhage, which was almost immediately fatal in two men, twenty-five and fifty-one years of age respectively. A similar case is reported by Welch in the Johns Hopkins Hospital Bulletin, No. 1, respecting a miliary aneurism of a submucous branch of the coronary artery midway between the cardia and pylorus occurring in a man of fifty. There was neither atheromatous nor other disease of the systemic blood-vessels. Perhaps the cases already mentioned of hæmatemesis in scurvy, purpura, yellow fever, and progressive pernicious anæmia, in malaria and exanthematic fevers, belong to this class, although we are at present unable to trace alterations of the walls of the vessels in these processes. When, however, as in the case of atheroma in old people, extensive alterations of the vessels exist, as far as my experience goes they do not lead to hæmatemesis.

It is evident that the treatment of hæmorrhage varies greatly according to its cause, and that it is important both for prognosis and for treatment to ascertain whether hæmatemesis is produced by an obstruction, or by active hyperæmia, or by a process which destroys the mucous membrane. In the first case mild derivatives are sufficient, and it is hardly ever necessary to make use of energetic antiphlogistics, which can only be prescribed when the pulse is very hard and of high tension, and there are symptoms of general plethora; on the other hand, the whole apparatus of styptic remedies which are used for the treatment of hæmatemesis in destructive processes (see page 478) should be avoided. Applications of cold water to the epigastrium, with perhaps one or two leeches on the same part, pieces of ice, Haller's acid, alum whey, tartrate of soda, or small doses of rhubarb with sodii sulph. in water are sufficient in the first instance, but must be combined with a most carefully regulated diet to avoid the danger of a relapse.

---

* Gallard. Altérations peu connues de la muqueuse de l'estomac. Gaz. d. hôpit. 1884, p. 196.

LECTURE VII.

INFLAMMATION OF THE COATS OF THE STOMACH; GASTRITIS GLANDULARIS ACUTA, IDIOPATHICA, ET SYMPATHICA; GASTRITIS PHLEGMONOSA PURULENTA; GASTRITIS TOXICA.

GENTLEMEN,—Permit me to preface my discussion to-day with a few general remarks. Cohnheim said very truly, in his Lectures on General Pathology, that it is characteristic of diseases of the stomach for one and the same factor to affect the digestive processes in several ways. No doubt absorption, secretion, and motion stand in such close connection, that injury of one invariably involves injury of the others. Any alteration in the secreting activity, for example, by an attack of acute gastritis, changes the normal course of those functions of the organ which we now-a-days understand by its chemistry; but with any affection of its chemistry is indissolubly connected an affection of its absorption and an abnormal course of its peristalsis. If the production of acid and pepsine is insufficient, not only will the production of assimilable nitrogenous matter be delayed, but the degree of acidity by virtue of which active peristalsis is set up, causing the transference of the gastric contents to the intestine, will be attained late or not at all. The ingesta stagnate, undergo abnormal decompositions, whose products not only irritate anew the gastric mucous membrane, but alter the conditions of absorption, and exert a paralysing influence on the muscular wall by being taken up by the vessels, or by the mechanical distension of the organ with gas. Defective muscular movement reacts by diminishing the activity of absorption, defective absorption leads to stasis in the venous area, and this again to injury to secretion, so that a vicious circle is created. You can easily perceive that it is quite the same at whichever end you commence this chain; whether the first trouble is secretory or motor, or absorption is affected, the same results must always follow unless the failure of one function can be compensated for by the stronger action of another, by which the disturbance might be rectified. If it were possible to break the chain of induction, the result would be that the primary causes would no longer act, and a cure would follow; this may sometimes occur, for one sees from time to time catarrh cured by the most different treatment. But it is a question whether this occurs without our aid, without any therapeutic intervention. Cohnheim believed that the causes generally persist, and maintained that this was characteristic of stomach diseases, by which they very unfavourably distinguish themselves from heart disease, for example. I believe, on the other hand, that such a restoration of order often occurs, and that it is only by a sort of self-regulating power that the stomach can adjust the manifold derangements, partly direct and partly indirect, to which it is liable. It is when this self-regulating power fails that there occurs what we describe by the comprehensive name of dyspepsia. On close examination we find the heart and stomach to be circumstanced very much alike in respect to their power of self-regulation, only in the heart the process is of long duration, often very long, while in the stomach it is transitory. Moreover the heart passes from the stage of compensation into that of total insufficiency, while the stomach, on the other hand, returns to normal. In the heart regulation is at once and externally demonstrable, in the stomach it is latent and can be recognised only by results. But if the heart's muscle is diseased, or severe organic lesions of the stomach wall are present, there is no more question of regulation in one case than in the other. Nevertheless, a very high degree of disturbance of one component of the stomach function may be compensated by the increased action of another. How otherwise could we account for persons with complete absence of hydrochloric acid secretion being able to live for years without special dyspeptic complaints, as I have observed in quite a number of cases. The explanation of this condition, which at first sight is so strange, is to be found in the increased peristalsis of the stomach, which transfers the ingesta into the bowel before they have decomposed or are able to do other mischief. This is without doubt an example of a vicarious or regulating arrangement.

But clear and free from doubt as this fact may be, it is not enough to explain the close connection of all the functions of the stomach with one another. *A full understanding of the pathological processes in the stomach, and of the phenomena of deranged* *digestion, can only be obtained by considering the relations between the stomach, intestine, and liver.* Every stomach derangement reacts on the intestine and liver, and conversely every intestinal and liver affection interferes with the stomach. Improper chyme, either too acid from inorganic or organic acids, or containing much undigested food in a more or less unchanged condition mixed with mucus, will act as an irritating foreign body on the intestinal mucous membrane, until the action of the specific intestinal juices, bile, pancreatic juice, and intestinal juice proper, has succeeded in compensating the disturbance, that is, has properly digested this crude matter and restored normal conditions. At other times the superior portion of the duodenum is specially involved and doubly deranges the liver, in the first place mechanically, by swelling the opening of the bile duct (by which the flow of bile into the intestine is delayed, but jaundice is not caused); and secondly by the blood of the portal vein being contaminated by the products of incomplete digestion, which give rise to slowing of the portal circulation, and to consequent slowing of the excretion of bile. Lauder Brunton* has shown that the rapidity of the blood current through the excised liver depends very greatly upon the composition of the blood injected into its vessels. Slow circulation in the liver causes slow secretion of bile, and as the bile is not only anti-fermentative but fat-digesting, the intestinal digestion suffers doubly. A quite similar process occurs when the liver or intestine is the primary seat of disorder, only the order of proceeding in the stomach differs somewhat. It is not so much the circumstance that the intestines are full, and that the expulsion of the stomach contents meets with a certain resistance, or that the intestinal contents may be driven back into the stomach; it is not the reaction which every prolonged intestinal peristalsis exerts on the stomach peristalsis, so much as the hindering which the entire portal blood experiences in its passage through the liver, from which throughout the area from which this mighty venous trunk is derived, there results venous congestion and consequent disturbance, of which the stomach must bear its part. Venous congestion is developed, which, as we have already seen in the case of the delayed secretion which is connected with it, leads to sympathetic derangement of all the functions of the stomach. We have therefore, as it were, two closed circles in action in any case of dyspepsia, a small one which includes the stomach only, and a larger one which includes the stomach, intestine, and liver, in other words, the whole portal area. But the interference with the circulation in the liver has yet another importance. The liver has not only the duty of secreting bile, but it forms a sort of catch-pit, placed as it is between the right side of the heart and the blood of the portal vein, which catches all the toxic matter absorbed from the intestine, and either holds it and gives it up little by little to the blood, or destroys it, or excretes it again with the bile into the intestine. We know that the relatively harmless action of viper poison or curara when taken by the mouth is due to this property of the liver. We know the same concerning nicotine, and we must accept it for the poisonous properties of peptone.* If this poisonous action is not ordinarily observed, as is actually the case, this is because either it is reconverted in the intestinal wall into albumen, or because it passes into the general circulation in such small quantities and so slowly that it is harmless, or because it is stored up in the liver, or changed into other products. There are many grounds for the opinion (especially the amount of peptone contained in the blood of the portal vein) that the liver does possess such a purifying action, which may be observed when anything interferes with the action of that organ. The same is true of the products of intestinal digestion or putrefaction which have the character of alkaloids. These substances under normal conditions exert no influence on the system, whether it is that they are not absorbed owing to a selective power on the part of the intestinal epithelium, or that they are intercepted as above described in the liver, or that the quantity absorbed is too small to cause any poisonous effect. But after a very abundant meal this is changed, and the quantity of absorbed peptone rises suddenly. Discomfort, dulness, and some heaviness of the head, are the consequences which we seek to remedy by stimulants (coffee, strong liqueurs, &c.).

---

* T. Lauder Brunton, On disorders of digestion, their consequences and treatment. London, 1886, p. 25.

In still greater measure are such results met with if the intestinal digestion has for any reason become defective. Then either the normal impermeability of the epithelium is paralysed, or the function of the liver fails, or both conditions perhaps are combined, so that the poisonous substances are taken up into the blood, and more or less important toxic phenomena result. In slighter cases, which happily constitute the majority, there are only cerebral symptoms of a milder kind, tension, sleepiness, difficulty of thinking, headache, especially occipital headache. In worse cases the heart's action is involved, with palpitation or intermittent or irregular pulse, finally reaching to serious toxic symptoms, perhaps caused by the absorption of foul gases, of which a good example is afforded by a well-known case of Senator's.*

---

* Vide Part I., p. 90.

So you see, gentlemen, that we can speak in only a few cases of disturbances of the gastric digestion which are limited to themselves, namely, those only in which the disturbances in the stomach run such a rapid course that no time is allowed for the development of those functional derangements which are so closely connected with them. But this can only be the case in a relatively few examples of acute gastritis; in all others, even when they are called acute, there is time enough for their development.

Gentlemen, acute (and chronic) inflammation of the gastric mucous membrane is commonly described as acute (or chronic) catarrh of the stomach, and thereby a very unjust notion of its character is afforded. Catarrh, according to present notions, is nothing but an inflammatory process which we call "catarrh" when it affects chiefly the epithelial and sub-epithelial layers with slight involvement of the glandular elements, chiefly the mucous glands. The structure of the gastric mucous membrane, which is better described as the glandular coat of the stomach, the *tunica glandularis*, is such that there is no question of a mucous membrane in the ordinary sense, as it is much more composed of numerous closely crowded gland tubes with their ducts and epithelium. It is a glandular parenchyma with its attributes (interstitial tissue and ducts), and it is only by a peculiar adaptation of the internal coat of the stomach that the protoplasm of the epithelium of these ducts has the property of becoming converted into mucus, it containing a mucinogenous substance, just as the epithelium of the gland tubes proper is filled with a pepsinogenous substance. Every inflammatory process affecting this gastric "mucous membrane" must of necessity involve the glands, unless it is limited to their ducts only, against which clinical observation protests. The observations of Beaumont on his patient showed that even the slightest "catarrh" was accompanied by disturbance of the secretion of gastric juice, that is, it involved the glands themselves. It is not simply a catarrhal inflammation, but a parenchymatous and interstitial inflammation, which has nothing in common with catarrh but the "flux," the secretion of a more or less abundant but always alkaline fluid into the cavity of the stomach, but going hand-in-hand with a disturbance of the specific glandular secretion far beyond a simple catarrh. I agree entirely in this respect with the views expressed by F. A. Hoffmann.* That in speaking of it as catarrh we tend to under-estimate the importance of this process, especially when it is chronic, and to compare it in our minds with a chronic pharyngeal catarrh, is to lose sight of its due proportions. In future, therefore, when I speak of acute or chronic catarrh I always mean a gastritis, or better, a gastroadenitis, which runs an acute or chronic course.

---

* Senator. Berl. klin. Wochenschr. 1868, No. 24; Emminghaus, ibid., 1872, p. 477.

We can distinguish etiologically the following forms of acute gastritis: *gastritis glandularis acuta simplex* (acute gastric catarrh) and *sympathica*, *gastritis toxica*, *gastritis phlegmonosa*, *idiopathica*, and *metastatica*. *Acute gastritis* is so common, and its causes are so frequent, that it belongs to the best known types of disease which we possess. Properly every acute gastritis is a toxic gastritis in the sense of a local irritation, as it is caused by toxic substances so far as are thereby understood locally irritating and corroding matters. Every overloading of the stomach acts in this sense "toxically," as every excess brings with it a number of irritant phenomena which ultimately lead to acute inflammation. The effect of excess is thus naturally relative, and amounts of food which under normal conditions would be harmless, may, under abnormal circumstances, do harm. A convalescent patient gets acute gastric catarrh from a beefsteak, which the same man manages easily when he is well. A man who has been nearly starved can only return with great prudence and very gradually to his ordinary allowance of food. Of the fifteen shipwrecked survivors of the "Medusa," three died after their rescue from eating too ravenously. But many men have a sort of predisposition to catarrh of the stomach, as others are predisposed to nasal or pharyngeal catarrh, and in them quantities and kinds of food act as irritants which are quite harmless to healthy stomachs. In man this predisposition is sometimes distinctly inherited—I find indeed in the text-books, with the exception of Lebert, that this is not stated—but it has been so often told me by patients, either spontaneously or in answer to questions, that their father or their mother had suffered from a weak stomach, or that their brothers and sisters are liable to it, that I cannot doubt it. Hoffmann in his general pathology says, "every one has the stomach which he deserves," which may be often true, not only of stomach patients, but is very unjust to persons suffering from weak stomachs. It is notorious that there are a small number of patients who treat their stomachs year by year with the greatest care and caution, and still cannot help somehow or other getting acute and chronic catarrh. The quality, like the quantity of the food may cause irritation. Bad food and drink irritate the stomach, so as to cause inflammation, probably because the micro-organisms act as exciters of inflammation and putrefaction, so that we may speak of this as a bacillary affection, if we understand by this that the disturbance is to be attributed to the action of micro-organisms. But it must not be understood in the sense of a direct invasion by them. It has seemed to me very remarkable that in the numerous opportunities I have had of examining still warm pieces of mucous membrane, I have never found anything but traces of microbes in the tissues, although they are so abundant in the stomach contents. Yet I willingly admit that I have paid only passing attention to this point, and have not given it exclusive consideration. Smirnow* has examined six cases of *gastritis membranacea diphtherica*, and although he found numerous micrococci and bacilli in the false membrane he could not observe any in the lumina of the glands or in the tissues. But as the abnormal products of decomposition, which irritate the gastric mucous membrane, always have for their cause organised ferments, I believe that gastritis in this sense is to be ascribed in the last instance to the action of micro-organisms. It depends upon the quantity in which they are introduced into the stomach, whether the anti-fermentative action of the gastric juice in the individual concerned can limit or suppress the decomposition. As we always take into the stomach a certain quantity of micro-organisms with our food, there must be also a disproportion between the above-named factors, the foreign intruders, and the legitimate production of acid. With respect to this disproportion I might allude to the influence which psychical impulses and nervous disturbances possess over the occurrence of acute gastric catarrh. Under such conditions a weaker gastric juice is secreted, the motor and expulsive force of the stomach is paralysed, and free play is given for the rapid growth and great development of any exciters of putrefaction which may gain admission. The latter, that is, the ferment exciters, are, however, never wanting. We introduce them constantly with food and drink, and a special part of the action of the stomach consists in disinfecting the food by means of its secretion, and so preventing abnormal putrefactions. Where this is absent or insufficient, decomposition with its consequences occurs.

---

* F. A. Hoffmann. Vorlesungen über allgemeine Therapie. Leipzig, 1885, p. 169 et seq.

---

* G. Smirnow. Ueber Gastritis membranacea und diphtherica. Virchow's Arch. Bd. 113, p. 333.

Hence I believe we ought not to over-estimate the importance of this anti-fermentative action.

In the first place, the now often quoted cases of purely intestinal digestion (in which the gastric juice is quite insufficient, or at any rate does not contain hydrochloric acid, although digestion takes place perfectly), prove that defective disinfection in the stomach under certain conditions may be compensated for in the intestine, or may cause no noticeable ill effect. In the second place, it is known that in acute gastritis, in no degree extensive decompositions occur, although free hydrochloric acid appears to be regularly absent.

Of the products of putrefaction, lactic acid comes first under consideration. The circumstance that it is normally present at the commencement of the digestion of bread is opposed to the idea that it possesses a specially irritating property, and stamps its presence at this time as physiological; but if lactic acid, as we shall see, persists under certain conditions, and can be demonstrated in large quantities in the later stages of digestion, we have to do here not with a cause but with a consequence. Moreover we may, as is well known, give lactic acid medicinally or as a drink (kefir), not only without injury but with benefit to the stomach. I have had the opportunity of examining the gastric contents in many cases of acute gastritis immediately after its commencement. One case was that of myself. Without any error of diet, while leading a quite quiet life I was suddenly taken ill in the night. I vomited many times, bringing up at first large quantities of sour-smelling stomach contents, later bilious, mucous matter. The filtrate of the former contained no free hydrochloric acid, only traces of lactic acid, while on the other hand there were large quantities of fatty acids (according to the reaction). In three other cases of acute gastritis seen in inmates of my hospital, where acute gastric catarrh sometimes occurs after holidays and visiting days, I had the opportunity of examining what was first brought up. The cases occurred in persons between fifty and seventy years of age, who had at other times good digestions. In each case the filtrate contained no free hydrochloric acid, although the reaction was very acid (from acid salts), and there was no free lactic acid (extraction with ether). After addition of hydrochloric acid until there was a well-marked reaction, the digestion was slow and feeble. In spite of an intense rancid smell, fatty acids could only be demonstrated in traces. I lay stress upon the fact that the vomited matter was examined quite at the beginning of the attack. Later on we find in the stomach either only mucus with some remains of food, or after eating the test breakfast the almost undigested remains of bread, with absence of hydrochloric acid, and more or less considerable amounts of lactic acid. According to these observations there must be some other substances than lactic acid which occasion the necessary irritation for the production of gastritis. Whether it is fatty acid, or some other hitherto not recognised product of decomposition, must remain for the present undecided. But I cannot believe that, as for example, Le[illegible]be admits, the mechanical irritation of an excessive meal retaine[illegible] i the stomach can be by itself sufficient to set up gastritis. [illegible] doubtedly the common phrase speaks of "overloading" t stomach, but would an organ which normally is exposed loading of the most different degrees and unequal durations really irritated by the prolonged pressure of food?

To the chemical irritants belong the substances which [illegible] toxic in the narrower sense of the word, the relatively absolutely concentrated acids or alkalies, or certain dru belonging to the group of metals, copper, antimony, iodine, arsenic, phosphorus. Finally, we are obliged to include thermal irritants among the causes of acute gastritis, of which the too hot do less harm than the too cold. But while a cold draught of beer or water is often blamed for an attack of gastric catarrh, people do not find any fault with ice-cream, which is quite as cold, perhaps because it is taken in smaller quantities and is not swallowed so quickly. I have already (p. 451) related to you a case of this sort.

All clinicists and pathological anatomists complain that our knowledge of the *changes in the mucous membrane* in acute catarrh of the stomach is very slight, because not only is it naturally very seldom that we get a *post-mortem* examination in such a case, but because the examination always takes place some time after death, and the *post-mortem* changes, which take place very rapidly in the stomach, cannot be excluded, and do much damage. We must therefore refer to the experiments on animals which were performed by Ebstein,[*] Lösch,[†] and Grützner,[‡] and for human stomachs to the examinations of Edinger[§] and Kupffer,[‖] although the latter did not expressly concern themselves with the question of acute gastritis, but rather with the condition of the central and parietal cells.[¶]

We ought to mention here the works and contributions of Virchow, Klebs, Manassein, and others,[**] and more recently of Marfan[††] and Stintzig.[‡‡]

---

[*] Ebstein. Ueber die Veränderungen, welche die Magenschleimhaut durch Einverleibung von Alkohol und Phosphor erleidet. Virchow's Arch. Bd. 55, p. 469.

[†] Lösch. Ueber die nach Einwirkung abnormer Reize auf die Magenschleimhaut auftretenden pathologish-anatomischen Veränderungen. Allgem. Wiener med. Ztg. 1881, No. 50.

[‡] P. Grützner. Neue Untersuchungen über Bildung und Ausscheidung des Pepsins im Magen. Breslau, 1875.

[§] Edinger. Zur Kenntniss der Drüsenzellen des Magens, besonders beim Menschen. M. Schultze's Arch. Bd. 17, p. 209.

[‖] C. Kupffer. Epithel. u. Drüsen des menschl. Magens. München, 1883.

[¶] See part I., p. 62.

[**] R. Virchow. Der Zustand des Magens bei Phosphorvergiftung. Virchow's Arch. Bd. 31, p. 399.—Klebs. Handb. d. path. Anatomie. 1868, p. 174.—Manassein. Chem. Beiträge zur Fieberlehre. Virchow's Arch. Bd. 55. p. 452.—Uffelmann. Beobachtungen an einem Gastrotomirten. Deutsches Arch. f. klin. Med. Bd. 26, p. 441.

[††] Marfan. Troubles et lésions gastriques dans la phthisie pulmonaire. Paris, 1887.

[‡‡] Stintzig. Münchener med. Wochenschr. 1890.

Quite recently Sachs* has published a series of noteworthy and very interesting contributions to this question. In my opinion the above complaint is not quite well founded, because in many cases of acute disease which come to the *post-mortem* room there is an acute inflammatory condition of the gastric mucous membrane as an accompaniment of the primary disease—high fever, anæmia—even when the naked eye appearances give only slight signs or none at all of such a change. The *post-mortem* changes can easily be reduced to very small dimensions by washing out the stomach immediately after death and filling it with alcohol.

A human stomach with a completely normal mucous membrane is in my experience extremely rare, at least beyond forty years of age, and is only met with in persons who have died suddenly when in good health. I possess two stomachs which were obtained from such persons, one of whom died from a piece of meat sticking in his larynx, the other from a sudden machinery accident. The first of these stomachs was taken out very shortly, and the other shortly after death, and put in absolute alcohol. Both specimens show beautifully the structure of the normal gastric mucous membrane, and the distinct differentiation of the central and parietal cells. But if I compare with them preparations from other stomachs, I find that the latter all show more or less marked changes, of which the most striking is the infiltration of the interstitial tissue with round cells, which also wander on to the free surface of the mucous membrane.

If, as is certainly the rule, during the last few days before death, the stomach function has suffered, or the symptoms of an inflammatory condition have appeared, in most cases no distinction can be recognised in the fundus between the central and parietal cells, all the cells are much more equally granular, i part diminished in size, and detached from the *membrana propri* of the gland tubule. In some places cysts are formed, in which there are either some remains of epithelium, or there is only an enveloping membrane. The mucous cells are abundantly present in the pyloric region, and extend deep down into the gland tubules. This description agrees in the main with that given by the above-named authors, and the condition described proves that first there must have been an active inflammatory irritation, which expresses itself in the abundant cell proliferation, and secondly a condition of continuous activity of the gland cells, which show no accumulation of secretion, and do not present the well-known appearances of gland cells in a state of repose. At least so say the authors mentioned, so far as they adhere to Heidenhain's* views.

---

* **A. Sachs. Zur Kenntniss der Magenschleimhaut in krankhaften Zuständen. Arch. f. exper. Pathologie. Bd. 22, Heft 3; Bd. 24, Heft 1 and 2.**

I believe I ought to mention that this appearance of continued activity may also be equally well attributed to a complete cessation of their work. Either the secretion is formed and at once extruded, so that it does not accumulate in the cell, or it is not produced at all. In both cases the appearance of the cell is identical.

In the first stage of an acute gastritis I will admit increased cell activity as a consequence of inflammatory irritation, but it does not follow that their products are also qualitatively increased; on the contrary, a continuous secretion very poor in active principles is poured out. In the later stages, that is, to anticipate a little, in subacute and chronic inflammations, this is never the case. Not only is it a general pathological law that chronic inflammations paralyse the specific function of the organ concerned, but we know it directly from the circumstance that in chronic catarrh, that is, in the chronic catarrh associated with abundant secretion of mucus, a pure mucous secretion very poor in specific elements is poured out. Sachs, in his work already quoted, has laid great weight on the division of nuclei which may be seen partly in the cells of the interglandular tissue, the leucocytes, partly in the cells of the surface epithelium, partly in the cells of the "mucous glands of the stomach," and which affords a further proof of the active cell-division which occurs in this process. I have repeatedly seen indications of this, but have not obtained such distinct pictures as Sachs has drawn. A definite pathognostic significance, so far as our present knowledge goes, does not seem to belong to them.

With the naked eye the mucous membrane is seen to be wholly or partially swollen and reddened, and in places studded with little hæmorrhages. The classical testimony for the appearance of the mucous membrane under these circumstances is still Beaumont's Canadian, in whom its surface was covered "with numerous white dots and vesicles, something like coagulated lymph, between which were deep crimson patches," whilst food was found four hours after its introduction still unchanged and enveloped in a coating of yellow mucus, lying in the pyloric cavity.

---

* Part I., p. 59 et seq.

Symptoms.—Some authors, especially the French, have given themselves great trouble to distinguish different forms of acute inflammation of the stomach. Lebert distinguishes between acute gastric irritation from overloading with food, acute painful gastric catarrh with more functional disturbance, and divides this again into the non-febrile slight acute gastric catarrh, and the infective febrile gastric catarrh, and finally describes an acute inflammatory gastric catarrh. But if we look closely at these different forms, we find that the divisions are only artificial, and that there are really only two great groups, *non-febrile* and *febrile catarrh*. One is only an exaggeration of the other, where the process takes place so rapidly that the febrile acute gastritis sets in with a rise of temperature.

In immediate connection with an obvious gastric derangement there are sudden malaise, fulness, tightness, and distention of the region of the stomach, with tenderness on pressure, thirst, anorexia, and even loathing and disgust for food; the general symptoms, heaviness of the head, headache, specks before the eyes, and mental depression, take part in or usher in the scene. With these are associated as objective symptoms a coated tongue, which at the beginning of the affection is covered over its entire surface with a thick, smeary, whitish layer often coloured by food or medicine, and which bears the impression of the teeth at its edges, but later on usually becomes clean at the tip and sides. Sometimes there is *herpes labialis*. The epigastrium is generally tender on pressure, and painful spasms occur. The pulse is small and frequent, much saliva is secreted, and the pharynx is contracted, or there are spasmodic fits of yawning; the countenance is pale, the eyes without expression, the extremities cold, and quite a characteristic smelling perspiration may be observed. To these are added nausea and vomiting. Vomiting, even when it occurs for the first time long after food has been taken, brings up the little changed ingesta of the day enveloped in thick mucus, which either smells stale or very sour and pungent, and usually is as bitter as bile. But this is not the fault of the bile, as the above expression might suggest, but the bitter taste of peptone mixed with fatty acids, as it occurs equally in artificial digestion, for example in peptonised milk. Fresh bile is not bitter, but is tasteless. This I have proved many times by introducing the stomach tube into the empty stomach and forcing the bile by pressure into the stomach and thus getting pure bile (chemically verified). Lauder Brunton has made the same observation. The vomiting recurs repeatedly, and at length brings up only mucus and bile. At first it is easy, later on it is very painful, according as the spasms, as Skoda pointed out, involve the stomach itself or the region of the cardiac orifice, and in this way render the act of vomiting more difficult. The reaction of the vomited matter is neutral or feebly acid, containing no free hydrochloric acids, but lactic and fatty acids. The latter not regularly, but as above stated, according as the last food taken contained considerable quantities of lactic acid-forming bodies. Whilst the bowels are at first confined, the passage of the stomach contents irritates the intestinal mucous membrane, giving rise to borborygmi, rumblings and noises in the belly, generally audible at a distance, and the passage of foul-smelling flatus and watery stools, which are followed by some tenesmus. Under ordinary circumstances the condition comes to an end in from three to five days, or passes into a subacute or chronic state.

Febrile catarrh is distinguished from the non-febrile form only by the greater intensity of its symptoms, and by the accompanying fever. The latter comes on suddenly, and may rise as high as 40° C. (104° F.) or higher. The skin becomes dry, the pulse frequent, and the complexion livid. There is no evidence of Lebert's infective febrile gastric catarrh in the modern sense, that is, from bacillary infection. At one time this condition was called gastric fever, and was confused with enteric fever, from which we have learnt to separate it sharply by better knowledge of the latter. A new "resurrection" of gastric fever by F. Schmidt* as "a specific infectious disease," which he bases upon the observation of a small epidemic among soldiers, and which affords no evidence in favour of typhoid infection, fails in the chief point, the proof of infection.

The same is true of a school epidemic reported by Gussmann† in the Orphan Asylum at Stuttgart, in which out of 108 scholars,

---

* F. Schmidt. Zur Frage nach der Existenz des gastrisches Fiebers als einer eigenartigen Krankheit. Dissert. Berlin, 1885.

† Gussmann. Eine Epidemie von acuter Gastritis. Würtemb. Correspondenzbl. 1888, No. 22.

24, *i.e.*, 22·2 per cent., fell ill with acute febrile gastric catarrh with temperatures rising to 40·6° C. (105° F.). It was remarkable in this disease, which in other respects ran the ordinary course, that the complexions of the children were at first yellowish, then more greenish, and finally crimson. There is much here to suggest infection if the well-known toxic causes were certainly excluded, for at the same time numerous cases of acute gastritis occurred in the town and among the military population.

The *diagnosis* of simple non-febrile gastritis offers no difficulty. It can only be a question whether the stomach is primarily affected, or this was preceded by duodenal catarrh, which extends upwards with the symptoms of acute gastric catarrh. In such cases the tongue ought to be clean, and the commencement of the specific gastric symptoms to be preceded for a longer or shorter time by signs of irregular intestinal digestion. The stools would be either irregular or scanty, or their colour point to defective secretion of bile. The consequences of this sluggishness of the bowels is a blocking of the ingesta, the duodenum is filled, the stomach contents are retained, and suddenly without any error of diet having occurred, the symptoms of gastric catarrh come on. In the above-quoted personal experience this was no doubt the course of events, as in fact a period of defective action of the bowels had preceded the sudden attack of vomiting. Nausea and anorexia continued for twenty-four hours, and disappeared first after I had obtained a good movement of the bowels by means of a large dose of calomel. In such cases the reflex action of the bowel on the stomach, described in the early part of this lecture, becomes more manifest.

Gentlemen, I have in these remarks already repeatedly referred to the state of the tongue, and in the future I shall do so still more often. Is, then, the state of the tongue really an index to the stomach, or have they, as was at one time believed, nothing to do with each other, and does its condition only express the prevailing state of the mucous membrane of the mouth?

If you consult such a magnificent book as was in its time Henoch's* History of Abdominal Diseases, you will find the latter view maintained, on the ground that morbid coating of the tongue signifies nothing more than catarrh of the buccal mucous membrane, which is caused either directly by local irritants, such as cigar smoking, bad teeth, periostitis, angina, and irritant drugs, or by extension from other mucous membranes, the stomach or the intestine. This is certainly correct, and we must bear in mind the various agents which may cause coating of the tongue, so as to be able to distinguish in a given case between local and remote causes, but the correspondence which exists between the state of the tongue and that of the stomach in all cases where there is no question of a primary disease of the mouth, shows that there must be a more intimate connection than merely an independent catarrh, which is started only from the stomach, and could continue after the stomach trouble was over. We certainly have to do here with an uninterrupted reflex action of which we can easily follow the paths of nerve influence, and the older physicians were certainly right in laying great stress on the state of the tongue for the recognition of the condition of the stomach, and in making the tongue a help in their treatment.

---

* Berlin, 1863, p. 38.

This perhaps is the place to mention that the condition of the tongue may vary greatly, although not coated in the ordinary sense of the word. In ulcer of the stomach it is usually smooth, moist, and red, with a slight white coating at the base. In nervous dyspepsia and neurasthenia it is pale, rather bluish than red, smooth, and moist, while in some patients there are deep transverse furrows or excoriated depressions at the sides which cause great discomfort. Mere anæmia of the filiform papillæ may resemble a white coating. The tongue sometimes feels swollen and too large for the mouth, giving rise to constant acts of swallowing as if there were something in the cavity of the mouth to be swallowed.

The recognition of febrile acute gastritis may under certain circumstances be not at all easy. With care it can hardly be confounded with commencing enteric fever, of which the stair-like temperature curve is quite characteristic. Still, meningitis, peritonitis, and even hepatitis may begin in the same way, so that it is only by waiting that certainty of diagnosis can be attained. If the gastralgic pains are unusually severe in a case of gastritis, and in a case of biliary colic only moderately developed, if the accompanying gastro-duodenal catarrh is very marked and jaundice absent, in such a case the diagnosis is uncertain if the characteristic tenderness on pressure in the right hypochondrium does not help us out. In general, however, these difficulties exist more on paper than in practice, and diagnostic errors are of less importance, as the rapid course of the disease brings the diagnosis with it.

The treatment of acute gastric catarrh.—If it is correct that acute gastritis never arises spontaneously, but always as a consequence of some irritant introduced from without, and that after its removal the inflamed mucous membrane returns rapidly to its normal condition, the object of treatment can only be to remove the irritant and to prevent further disturbance, that is, to soothe the organ. But the stomach as a rule does all this for itself. Vomiting on one side and anorexia on the other are "Nature's treatment," which act promptly when not interfered with by the intervention of some over-zealous youthful disciple of Æsculapius. I do not even think the use of mild vegetable aperients, such as castor oil, necessary, because the bowel can generally act spontaneously, and the stomach is irritated anew by the fat in the castor oil. In these circumstances it is much better to give a soda powder or some magnesia citr. effervesc., or pulvis aërophor. laxans, and above all it is necessary to fast for from twenty-four to seventy-two hours, this being broken only when there is a real return of hunger. The current phrases of the laity, "the stomach must have something," or "no one can go two days without eating," are theoretical, as it is certain that a man can live for a long time on his own fat, which has been publicly proved of late years by the examples of the famous fasting men.

At first if spontaneous vomiting does not take place, but weight, fulness, pains, and oppression with eructation of offensive gas, show that the organ is still full, and the natural remedy of the organism for emptying it upwards or downwards is not sufficien it is right to empty the stomach artificially. The simplest an best means is to let the patient drink a good quantity, perhap half or three-quarters of a litre, of warm salt and water, and t irritate the pharynx with a feather or the finger; where this doe not suffice a stomach tube must be introduced.

In this way the patient generally manages to vomit, and one avoids the necessity for giving emetics, which may increase th nausea or renew the irritation of the stomach, otherwise we would recommend a dose of apomorphine, $\frac{1}{4}$ to $\frac{1}{2}$ cgm. (gr. $\frac{1}{24}$ to $\frac{1}{12}$), or a dose of 1·5 (20 grains) of ipecacuanha, with 0·05 (⅔ grain) of tartrate of antimony in one dose or divided, or in children a teaspoonful of ipecacuanha syrup. If the bowels remain confined for two days, prompt action may be obtained by some carbonate of magnesia in an effervescing mixture, or a spoonful of pulvis curellæ, or a glass of bitter water. I am a great advocate of calomel for this purpose, used in a single dose or not too often repeated, and I think that we in Germany, apart from children's diseases, do not recognise its value as fully as is done in England. Its mild purgative action, its chologogue property, its disinfectant action, due to its conversion into sublimate, are so many advantages against which the occasional occurrence of slight salivation is of little weight. In adults it should not be given in too small doses, about 0·4 (6 grains) twice with an interval of an hour between, combined perhaps with small doses of aloes (0·1 of the extract, 1½ grains) or colocynth (extr. colocynthidis 0·01= ⅐ grain). The decoction of cortex frangulæ, and the equally recommended decoction of senna, cause much more griping and pain in acute gastro-duodenal catarrh than in chronic cases. Where much pyrosis is present we must prescribe alkalies to neutralise the acids according to the old fashion, most suitably carbonate of soda, the carbonic acid gas liberated from which is a refreshing and invigorating stimulant to the mucous membrane, or, as appears to be more probable, its notoriously beneficial effect may be due to the anæsthetic action of carbonic acid gas, which was demonstrated by Brown-Séquard. Magnesia usta is not to be recommended because it is very insoluble.

GASTRITIS SYMPATHICA ACUTA

is an extraordinarily frequent accompaniment of numerous acute febrile diseases. All exanthematic infectious diseases, smallpox, measles, scarlatina, typhus and typhoid, croup and diphtheria, dysentery, pyæmia, and puerperal fever, are connected with disturbances of the stomach function, which can be directly shown not only to be direct reflex nervous actions, as for example the influence of fever on the secretion demonstrated by Hoppe-Seyler and Manassein,* but to occasion directly changes in the mucous membrane. It should, however, be stated that the influence of fever on the secretion and constitution of the gastric juice is by no means always present. I have certainly myself stated,* as the result of some experiments agreeing with those of Manassein, that the gastric juice in fever digests more slowly than that of healthy persons; but Sassezki† found that in fever patients without distinct dyspepsia no deficiency of digestive activity exists. That the secretion of hydrochloric acid is not seriously altered has been shown by Edinger‡ in five cases of fever (phthisis, recurrent fever, intermittent fever, typhus). Similar observations have been made by Klemperer§ and Schetty ‖ in febrile cases of phthisis.

---

* Hoppe-Seyler. Allgemeine Biologie, 1877, p. 242.—Manassein, l.c.

I have recently examined the test breakfast of a person, aged twenty-seven, with facial erysipelas, and temperature ranging from 39° to 40·5° (102·2° to 104·9° F.) on the fourth and fifth days of the fever. The acidity was slight (24 and 36), but free hydrochloric acid was present, and the filtered gastric contents digested in the ordinary time, while retardation of digestion manifested itself only by a somewhat larger amount than ordinary of propeptone. The patient had taken no medicine. Her general condition was good, with the exception of prostration, loss of appetite, and local pain. Ten days later, when I re-examined the stomach, the patient being completely convalescent, the acidity was 32, and the digestive activity the same as before. It remains questionable whether the normal acidity of this person is ordinarily much higher, as she could not be examined again, but the observation shows that even in high fever the gastric juice may not be seriously altered, and that the temperature *per se* does not influence the gastric glands, directly or indirectly.

This is another reason for believing that there is a materi change in the mucous membrane in the above-described condition of sympathetic stomach disorder. Although the gastri symptoms may be overshadowed by the other morbid phenomena yet when we have an early opportunity of examining th

---

[*] Part I., p. 111.

[†] Sassezki. Ueber den Magensaft Fiebernder. Petersb. med. Wochenschrift, 1879, No. 19.

[‡] L. Edinger. Zur Physiologie und Pathologie des Magens. Deutsches Arch. f. klin. Med. Bd. 29, p. 555.

[§] G. Klemperer. Ueber die Dyspepsie der Phthisiker. Berliner klin. Wochenschr. 1889, No. 11.

[‖] F. Schetty. Untersuchung über die Magenfunction bei Phthisis. Deutsches Arch. f. klin. Med. Bd. 44, p. 219.

stomach in cases which have presented dyspeptic troubles, we find the anatomical changes of acute gastritis.

In diphtheria, small-pox, and scarlatina, it may amount to the formation of a pseudo-membrane with diphtheritic ulceration.* According to Smirnow,† in such cases there are two forms of disease. In one case there is only more or less hyperæmia, with extravasation and desquamation of the glandular epithelium, without destruction of the special secreting parenchyma, that is, a fibrinous inflammation; in the other the mucous membrane itself becomes affected by a necrobiotic process, and undergoes what von Recklinghausen has described as hyaline degeneration of the cellular elements. Kalmus‡ has found in such cases numerous bacilli not only in the exudate and necrotic tissue, but also in the deeper parts of the sound tissue, and even in the submucosa; whilst Smirnow, as already stated, found the tissues throughout free from organisms. Kalmus found gastric diphtheria in 6·5 per cent. of his (199) cases. The seat of the diphtheritic ulceration is generally at the cardia, and extends in streaks into the stomach cavity. In other cases we find, especially in the fundus, little yellowish or brownish sloughs with reddened areolæ, or membranes formed of fibrin, mucus, desquamated glandular epithelium, and products of their destruction, or they are in part of an exudative character. They separate with deep losses of substance by sloughing of the upper layers of the mucous membrane, and may give rise to fatal hæmorrhage. This certainly goes much beyond simple acute gastritis, which, as a rule, passes into a chronic state without any of these serious consequences, and persists after the remission of the primary disease, and may retard convalescence. *Acute gastritis* passes into *subacute* and *chronic gastritis*.

But when it is stated that subacute catarrh develops out of acute catarrh, this can only be admitted with reserve. Many cases are indisputably subacute at first and suddenly become acute.

The French describe *subacute catarrh* under the very suitable name of "embarras gastrique," the English call it "indigestion," while by us it is spoken of as "Status gastricus." Its symptoms and treatment are so closely connected with chronic gastritis that I will not waste time over a special description, but refer you to the section on chronic gastritis.

---

* Cahn. Ein Fall von Gastritis diphtherica bei Rachendiphtherie mit acuter gelber Leberatrophie. Deutsches Arch. f. klin. Med. Bd. 34, p. 113.

† G. Smirnow. Ueber Gastritis membranacea u. diphtheritica. Virchow's Arch. Bd. 113, p. 356.

‡ G. Kalmus. Ein Beitrag zur Statistik und pathologischen Anatomie der secundären Magendiphtherie. Inaug.-Dissert. Kiel, 1888.

PURULENT INFLAMMATION OF THE STOMACH, GASTRITIS PHLEGMONOSA PURULENTA.

This mostly acute, rarely subacute, inflammation of the stomach differs from acute gastritis by never involving the glandular layer, but is seated in the sub-mucosa and muscularis, and in opposition to the frequency of the other, it is a very rare disease of the stomach. I can remember only one case, in a maid-servant, which I saw in Frerichs' wards. But in recent times, after Andral and Cruveilhier, Rokitansky and Dittrich, Habershon and Brinton had described and established it, quite a number of instructive cases have been published, so that it is quite easy to give a sufficient outline of the disease.

The male sex appears to suffer most from the disease. Lebert in thirty-one cases found twenty-six males and five females. If we count the cases published since that time (1878), there are, according to Glax,[*] fifty-one cases; of forty-one of these, thirty-three were males and eight females. The usual age is from twenty to sixty years. We have to distinguish between a *primary idiopathic* and a *metastatic* form.

Respecting the causation of primary phlegmonous gastritis we know nothing, at least I cannot regard the vague statements respecting alcoholism, errors of diet, injuries, &c., as of any value. It is here if anywhere in the whole range of diseases of the stomach that we have a series of phenomena which suggests an infectious disease, and according to our modern views a disease dependent on micro-organisms. In fact Ziegler[†] states that he has found numerous streptococci, partly free in the tissues, partly enclosed in the cells.

A second form is the metastatic, which occurs in severe pyæmia or in puerperal and exanthematic fevers, or proceeds from a perigastric abscess.

Pathological anatomy has to distinguish between circumscribed abscess formation, *gastritis phlegmonosa circumscripta*, the stomach abscess of authors, and diffuse purulent infiltration. Abscesses are usually small, from the size of a pea to a hazel-nut, but may attain the size of a walnut or goose egg. The mucous membrane is elevated over these spots, and on section we see that the abscess is situated in the submucosa, at times infiltrating the muscularis or bringing about a condition of purulent softening and penetrating down to the serosa. In advanced stages perforation may take place into the cavity of the stomach or of the abdomen. Diffuse infiltration creeps along the submucous tissue, and sends processes between the gland tubules of the mucosa as well as between the muscular bundles of the muscularis, whilst the muscles themselves show fatty degeneration or nuclear proliferation and infiltration with pus cells. There may be sieve-like openings in the surface of the mucous membrane through which the pus pours on pressure; or the pus sinks towards the serosa, pushes this out and perforates it, unless it has previously become adherent by inflammation to neighbouring organs.

---

[*] J. Glax. Die Magenentzündung. Deutsche med. Ztg. 1884, No. 3.

[†] Ziegler. Lehrb. d. allg. u. spec. path. Anat. 1887, p. 516.

Symptoms.—The disease runs for the most part an acute, one may say *foudroyant* course, and a chronic course appears to belong to the exceptional examples of this rare disease. It either comes on very suddenly, as in the case observed by me, or after vague preliminary digestive pains, with excessively severe and intense pain in the epigastrium, which is associated with burning in the stomach, great thirst, dry tongue, and complete anorexia. The patients have from the beginning the feeling that they are seriously ill; high fever to 40° (104° F.) sets in, sometimes running up with rigors, followed by slight remissions. The pulse is small, quick, and irregular. Vomiting, which is rarely absent, brings up bilious or shiny matter, or a quantity of pus.*

The sensorium is always severely affected, restlessness and anxiety being so great in one case observed by Lebert, that the patient threw himself from a window and died; even delirium occurs, and death follows in coma or general prostration. That such a condition may simulate acute rheumatism is not to be wondered at, and in fact we find the following case described by Macleod:† A workman aged thirty-six had been ill for fourteen days with symptoms of acute rheumatism. No pain in the stomach, no vomiting. Delirium and great restlessness, which were attributed to his drinking habits. He died comatose. The autopsy showed the stomach wall in the region of the great curvature and the pylorus thickened to 1·5 cm., and a quantity of yellow pus lay between the muscularis and submucosa. The mucosa was unaffected. There was no inflammation of joints or any other purulent inflammatory process.

---

* Bukler. Idiopathisch-phlegmonöse Gastritis. Bayer. ärztliches Intelligenzbl. 1880, No. 37.

† Macleod. Suppurative gastritis; death; necropsy. Lancet, 1887, vol. ii. p. 1166.

Grainger Stewart[*] has observed inflammation and gangrene of the gall-bladder. W. Lewin[†] saw petechiæ over the whole body, which were as large as a hazel-nut on the right thigh, and afterwards jaundice supervened. The autopsy showed multiple abscess formation between the mucosa and serosa of the stomach, diffuse purulent peritonitis, and purulent left pleurisy.

Brinton and Chvosteck,[‡] too, found jaundice in idiopathic phlegmonous gastritis, and explain it by extension of the inflammation to the duodenum and to the opening of the bile passages, if it is not a sort of pyæmic jaundice. Gläser[§] has observed as a very rare occurrence the establishment of the disease in the course of carcinoma and of gastric ulcer, very curiously in the absence of the vomiting which is otherwise so constant.

During its course the bowels are either completely confined, or, as is more common, we get diarrhœa with marked meteorism and gurgling. The disease lasts at longest fourteen days, generally less. A duration of four weeks, as in the above-quoted case of Lewin's, is most exceptional.

Diagnosis.—From the symptoms you will have seen, gentlemen, that the diagnosis of phlegmonous gastritis, when it can be made, is at most only accidental. The process resembles on the one side a circumscribed peritonitis, and on the other perigastric inflammation or abscess; for example, an arteritis, or an abscess of the left lobe of the liver or of the spleen, may give rise to such deceptive symptoms, that an exact differential diagnosis is an impossibility.

I cannot agree that, as Deininger[‖] thinks, the high fever, the fixed stomach pain not increased by movement, and the increased resistance in the epigastrium give sufficient grounds for diagnosis, and I am of opinion that the doubt expressed by Leube in 1879, as to the possibility of making a diagnosis, has not been removed by subsequent discussion. Only when great quantities of pus are vomited, and when, as in a case of Callow's, and in a similar one of Deininger's, a palpable tumour disappears after vomiting pus, is it possible to diagnose the condition with certainty. The severe and lasting pains do permit of its differentiation from exanthematic typhus, to which the course of the fever and the subsequent appearance of petechiæ have some resemblance.

---

[*] Grainger Stewart. Edin. Med. Journal, Feb. 1868.

[†] W. Lewin. Berliner klin. Wochenschr. 1884, p. 73.

[‡] Chvosteck. Wiener Klinik, 1881, and Wiener med. Presse, 1877, Nos. 22 to 2

[§] Gläser. Berl. klin. Wochenschr. 1883, p. 790.

[‖] Deininger. Deutsches Arch. f. klin. Med. Bd. xxi., p. 628.

The treatment can be only symptomatic, that is, antiphlogistic. Cold applications to the abdomen, leeches, ice pills, iced soda mixtures, subcutaneous injections of morphia, and stimulants are the only means which we possess under such circumstances.

MYCOTIC AND PARASITIC GASTRITIS.

The little that we know concerning the invasion of micro-organisms into the mucous membrane of the stomach finds its proper place here, in concluding our remarks on the phlegmonous inflammations.

Respecting the invasion of coarse fungi, there is, so far as I know, only one unique case, reported by Kundrat,[*] which was that of the growth of the favus fungus in the mucous membrane of the stomach and intestine, in a case of universal favus in a drunkard. In this case the fungus had brought about a croupous-diphtheritic condition, with formation of ulcers and sloughs and fibrinous masses of exudation. According to Kundrat, the mucous membrane was predisposed by the chronic catarrh of drunkards. Death was caused by uncontrollable diarrhœa.

Klebs[†] has described in a number of cases a bacillus gastricus which possesses numerous spores, and is found in the free lumen of the gland tubules, or between the *membrana propria* and the epithelium. Respecting the clinical history of these cases, unfortunately we have no knowledge. Orth[‡] reports a case of ulcer, in which, in the grey, bran-like scales on the mucous membrane, there were numerous rod-shaped bacilli. The micro-organisms found in diphtheritic disease of the gastric mucous membrane have been mentioned already (v. p. 503).

---

[*] **Kundrat. Ueber Gastroenteritis favosa. Wiener med. Blätter, 1884, No. 49.**

[†] **E. Klebs. Ueber infectiöse Magenaffectionen. Allgem. Wiener med. Ztg. 1881, Nos. 29 and 30.**

[‡] **J. Orth. Lehrbuch der spec. pathol. Anatomie, 1887, p. 704.**

Among those best known at present are the affections in anthrax, where the bacilli, as Orth says, "either in person or in the form of spores, reach the stomach directly from without or from the blood." They give rise to intense circumscribed swellings of the mucous membrane, and especially of the submucosa, with central sloughing and consecutive ulceration.

The presence of sarcinæ, torulæ, and numerous micro-organisms in the contents of the stomach, appears, as we have already stated in connection with fermentations in the stomach, never to exert any direct irritant effect on the gastric mucous membrane. But some recent observations induce me to believe that sometimes a dyspeptic disorder, obscure in its nature and chronic in its course, is caused by the development of hyphomycetes (especially leptothrix) on the surface of the mucous membrane. On the other hand it may here be remarked concerning foreign parasitic organisms, though not of a mycotic nature, that Gerhardt[*] has observed an acute gastritis, caused by the invasion of dipterous larvæ, which were probably introduced with some raspberries; and Meschede[†] has seen the same condition result from maggots in cheese. On the other hand Lublinski[‡] found that the larvæ of the house fly, which in his case were swallowed with raw meat and expelled by vomiting, remained without special influence. Fermaud[§] had long ago observed somewhat similarly gastritis and gastralgia following an earthworm in the stomach, and it has been long known that ascarides or round worms, even tæniæ, which wander into the stomach, may set up acute gastric catarrh.

TOXIC INFLAMMATIONS OF THE STOMACH, GASTRITIS TOXICA.

We can only briefly review the various poisons which exert a direct influence on the gastric mucous membrane. Alcohol, phosphorus, cyanide of potassium, arsenic (Scheele's green), corrosive sublimate, chlorate of potash, nitro-benzol, the concentrated mineral acids (also carbolic acid), and the caustic alkalies are the most common.

---

[*] C. Gerhardt. Magenkatarrh durch lebende Dipterenlarven. Jenaer med. Zeitschr. Bd. 3, p. 522.

[†] Fr. Meschede. Ein Fall von Erkrankung, hervorgerufen durch verschluckte und lebend im Magen verweilende Maden. Virchow's Archiv. Bd. 36, p. 300.

[‡] W. Lublinski. Deutsche med. Wochenschr. 1885, No. 44.

[§] Fermaud. Observation sur une cardialgie accompagnée de symptômes de gastrite intense reconnaissant pour cause la présence d'un ver terrestre dans l'estomac. Journ. de méd. pratique de Paris, 1836, Tome 7, p. 57.

After Virchow[*] had much earlier described the fatty degeneration of the glandular epithelium, Ebstein[†] showed in an interesting series of investigations the influence that alcohol and phosphorus exert on the glands of the stomach, and discovered the very important fact that on the introduction of these substances, which are only the prototypes of a series of similarly acting bodies, the macroscopic changes may be very slight, while the finer structure of the glandular layer is seriously altered. Whilst macroscopic examination detected only slight hyperæmia and a little extravasation of blood, the microscope showed the epithelium of the vestibules of the glands, and the gland cells themselves, granular and cloudy in part, having undergone mucous and fatty degeneration, while the inter-glandular tissue was infiltrated with small round cells. There exists also a *gastritis glandulosa degenerativa*, which in favourable cases heals only slowly, and which explains the long duration of digestive disturbances after phosphorus poisoning, and the influence of the abuse of spirits on the stomach.

But the facts are different in corrosive poisoning. I cannot enter here into the classical description of poisoning with sulphuric acid, hydrochloric acid, oxalic acid, or caustic alkalies, and will only remind you that the effects are more or less extensive, according to the quantity swallowed, and the amount and composition of the contents of the stomach before they are taken. In slighter cases the damaged parts separate insensibly and cicatrise; in severer cases the cauterised mucous membrane and submucosa become converted into a black slough, the muscularis becomes œdematous or gelatinous, or is charred down to the serous coat, and rupture of the stomach takes place with extravasation into the abdominal cavity. The metallic poisons tend more to cause general inflammation and hyperæmia, or circumscribed foci with superficial necrosis. Elaborate drawings of these conditions are given in Lesser's[‡] Atlas. The symptoms of poisoning vary of course according to the nature of the poison in question, which, when it belongs to the group of corrosive fluids, includes in its action the primæ viæ, mouth, pharynx, and œsophagus. But the acute action on the stomach cannot be mistaken, because the sudden onset of all the symptoms, the frequent scarcely controllable vomiting, often mixed with bloody mucus or pure blood, the intense pain in the stomach increased by vomiting, the deep collapse, the sinking of the features and cyanosis, the coldness of the extremities, which are covered with clammy sweat, and the small pulse, all point to poisoning, which is confirmed either by the history or by examining the vomited matter. These are the acute cases of poisoning, which when they do not result in death, always leave behind them a long illness, and all the symptoms of severe disturbance of the stomach functions—disturbances which arise in part from deep alterations in the wall of the stomach, especially of the glandular layer, and its eventual ulceration, in part in consequence of cicatrisation. Under such conditions there may be a shreddy exfoliation of the mucosa and submucosa, as in Laboulbène's noted case, where fifteen days after poisoning by sulphuric acid a piece of membrane larger than two dinner-plates was vomited. In speaking of chronic gastritis we shall have to return to another group of poisonings of a chronic nature. It cannot be my business, gentlemen, to describe to you here the diagnosis of individual acute poisonings or their treatment. But you will permit me to state, generally, that all poisonings which are not effected by corrosive substances, and this should be always ascertained at once by inspection of the cavity of the mouth and pharynx, should be treated by carefully emptying the stomach with the stomach tube. I prefer it to the use of emetics, because their action involves a certain loss of time, and is often uncertain, especially in comatose persons. It is possible to cleanse the stomach more thoroughly by repeated siphoning than by emetics, and the tube may be introduced however deep the coma; a gas-tube, which may be easily adapted, as I stated as long ago as 1875, in connection with a case of poisoning by nitro-benzol,* is now-a-days generally to be obtained, but there is a difficulty in my experience in getting a funnel quickly,—I have used a medicine bottle of which I had broken out the bottom, and pushed the neck into the tube; only after thoroughly washing the stomach can other remedies be tried. In cases of corrosive poisoning, on account of the danger of perforation, the introduction of the stomach tube should be avoided, and neutralising substances in solution should be administered. Acid poisoning, too, scarcely needs the stomach to be washed out, as by pouring in a flood of magnesia usta (about 100 parts of magnesia suspended in 500 parts of water), which combines with hydrochloric, sulphuric, and nitric acids to form harmless, and with oxalic acid, to form insoluble, salts, we can neutralise the remains of acid not absorbed. Still, we should always give alkalies as well, preferably easily soluble soda salts, to prevent the dealkalisation of the blood. Caustic alkalies should be neutralised by solutions of citric acid (1 to 5 per cent.), or vinegar or lemon juice.

---

[*] l.c.

[†] l.c.

[‡] A. Lesser. Atlas der gerichtl. Medicin. Berlin, Hirschwald, 1884.

---

* Ewald. Zwei Falle von Nitrobenzolvergiftung. Berl. klin. Wochenschr. 1875, No. 3.

LECTURE VIII.

GASTRITIS GLANDULARIS CHRONICA, CHRONIC GASTRIC CATARRH.

GENTLEMEN,—In the course of time *gastritis glandularis chronica* has been called by the most different names: chronic gastric catarrh, *status gastricus*, atony of the stomach, *catarrhus pituosus*, habitual dyspepsia, indigestion, *gastricismus*, bradypepsy, apepsy, &c., and this multitude of names will show how many different conditions have been united under this heading. For example, Copland describes as dyspepsia a condition which is evidently due to ulcer. Todd* distinguished between idiopathic and deuteropathic dyspepsia, and divided the former into functional and organic, the second into symptomatic and sympathetic, while in addition he recognised atonic, inflammatory, irritable, and follicular dyspepsias. Ross† made three great groups, viz., (*a*) inflammatory dyspepsia, (*b*) functional dyspepsia, (*c*) organic dyspepsia, and divided these again into no less than nine sub-orders. If we except the notorious *gastro-entérite* of Broussais, which played a leading part for a long time in the French descriptions of stomach disorders, we find that dyspepsia occupies a very wide space in all text-books, even up to the present day. It is true that Damaschino‡ says of it, "la dyspepsie n'est pas une entité morbide," but nevertheless he treats of dyspepsia at length, and describes dyspepsie flatulente, acide, and even, following Chomel, a special "dyspepsie des liquides"; and Germain Sée,§ who expressly describes dyspepsia as an "opération chimique défectueuse," maintains this purely symptomatic classification, and divides dyspepsias into those with failure of chemistry and those with defects of mechanism. It is just as absurd as if we were to write of dropsy as an independent disease, for we have long ago advanced from the symptomatic to the anatomical classification of diseases.

---

* Todd. Article Indigestion, Cyclopædia of pract. med. London, 1833.

† J. Ross. Practical remarks on the treatment of various forms of dyspepsia, Edin. Med. Journal, Sept., 1855.

‡ F. Damaschino. Maladies des voies digestives. Paris, 1880.

§ Germain Sée. Du régime alimentaire, Paris, 1887; and Des dyspepsies gastro-intestinales, Paris, 1883.

The Germans were the first to depart from the nosological unity of dyspepsia, and to adopt in place of it a pathological standpoint, so that Lebert very properly omitted the heading "dyspepsia" in his treatise on diseases of the stomach. In fact such expressions as dyspepsia, indigestion, bradypepsy, apepsy, &c., are only descriptions of functional disturbances, not of definite morbid processes, and now-a-days no physician regards disturbance of digestion as an independent disease.

But if we go through in historical order the authors who have laboured in this department of diseases of the stomach we find that the outline of the article on dyspepsia gets gradually smaller, that is, in other words, from time to time specialised forms of disease are separated from this great group. To take only two examples, irritable and atonic dyspepsia are now enumerated under the neuroses of the stomach, and a part of that which the old authors called pyrosis or heartburn belongs to what we speak of to-day as *hypersecretio acida*.

I shall have to return to this subject in describing the condition of hyperacidity which I class with the neuroses of the stomach. I will only remark here, that we must nevertheless distinguish between a catarrhal, that is, chronic inflammatory condition of the glandular layer of the stomach, and a nervous affection of the same, whether resulting from direct or indirect irritation. The inflammatory conditions are accompanied by a diminution of the specific gland products, of secretion of hydrochloric acid and pepsin, and by a more or less abundant alkaline exudation. The sum of both these factors gives the absolute acid or alkaline contents of the stomach, as produced by the stimulation of the ingesta. But the degree of acidity is always diminished, and it completely contradicts the pathological significance of inflammation, and therefore of chronic catarrh, to speak of an "acid catarrh," as has recently been done in entire ignorance of the principles of medicine.

It is much the same for the formation of mucus, which here as little as in other glands, *e.g.*, the submaxillary, goes hand-in-hand with the specific secretion. The amount of organic constituents in the saliva becomes, as secretion continues, less than the inorganic, and probably also, though on this point our knowledge is not certain, the amounts of mucus and ptyalin stand, not in direct, but in inverse proportions.*

In analogy with this, it is actually the case, that while the specific secretion may completely fail, the production of mucus may be very considerable. All those conditions, however, in which an increased production of gastric juice occurs, must be regarded as neuroses of the stomach, whether it arises from an abnormal reaction to a physiological stimulus, that is, when it only occurs during digestion, or a persistent irritation keeps the glands constantly secreting. These are the conditions to which we apply the terms hyperacidity and hypersecretion. I shall have to describe them more fully under the heading of nervous disorders of the stomach.

The anatomical picture of chronic gastritis is a further development of the acute form. The mucous membrane is for the most part yellowish grey or slate grey, with insular vascular deeply injected patches of a more scarlet or brownish red colour; it is generally thickened, being on an average from one to two millimetres in thickness, and is covered with a thick sticky layer of mucus; in many places it rises from the tense submucosa, as it stretches more than the latter, in wart-like prominences, and forms the so-called "état mamelonné," an expression which is applied by many authors, not to this condition, but to polypous growths of the mucous membrane.† This process especially affects the pyloric portion of the stomach, but also attacks the fundus, and involves the whole mucous surface. The muscularis and submucosa also may be thickened, and the former, especially at the pylorus, may attain to hypertrophic stenosis. When this condition is very marked Brinton has called it cirrhosis of the stomach, and it is described by French writers as hypertrophic sclerosis of the submucosa and muscularis.‡

The minute anatomical changes are those of parenchymatous and interstitial inflammation. The gland cells are in part wasted, in part granular, and in part shrivelled; the distinction betwee central and parietal cells cannot be recognised; in many place especially in the pyloric region, the tubules have lost their regul relation to each other, and present a multiple, glove-finger-like, atypical ramification. Some glands are cut off at the fundus and appear at the edges of the submucosa as cysts, in part empty with smooth membranes, in part filled with the remains of cubical hyaline epithelium. An abundant small-celled infiltration, which in places pushes the gland tubes far apart, lies between them, and is specially marked near the surface. In the hyperplastic form tree-like processes of connective tissue from the submucosa ramify between the glands. The free edge of the glandular layer is covered with a layer of mucus which encloses numerous leucocytes and cell nuclei. The superficial epithelium of the mucosa is loosened and comes away easily in connected shreds, which are brought up on washing out the stomach. The following figure (fig. 19) shows distinctly such a shred of epithelium from around the entrances to the gland tubules. The epithelium of the vestibule is for the most part filled with a clear mucous material which, as Kupffer* describes, in normal stomachs projects into the lumen without any enclosing membrane.

---

* See part I. pp. 35 and 37.

† For example by Orth, l.c. p. 709.

‡ Hanot and Gombault, Arch. de physiol. ix. p. 412; Dubujadoux, Gazet hebd. 1883, p. 198; Kahlden, Ueber chronische sclerosirende Gastritis. Centrlb f. klin. Med. 1887. No. 16.

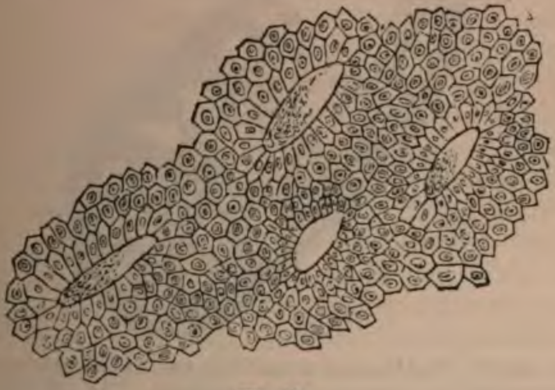


Fig. 19.

I have been able to study closely this and the following conditions in preparations which were obtained either immediately after death or during life (pyloric resection). In the form of mucous catarrh, still to be described, this mucous degeneration of the cells is seen to extend deeply into the glands, so that in place of the ordinary central and parietal cells are found cells in the various stages of mucous transformation. This condition is especially well marked in the pyloric region. Some cells are still unruptured, and the mucus takes up only a little part of them, whilst the rest of the cell is filled with granular protoplasm and a large nucleus. In others the mucus fills the greater part of the cell, and pushes the protoplasm and the flattened nucleus towards the base. In still others the cell membrane has burst and the mucus is poured out into the open lumen of the gland tubule, where it is precipitated in streaks by the alcohol; so that we get a very pretty appearance resembling a number of horseshoes arranged in a row with their openings towards the lumen of the tubule. In fig. 20 is represented the appearance under a high power of a gland tubule cut obliquely. It is the part of the gland tubule below the so-called gland neck which is shown in the section, further details of which are given

---

* Kupffer. Epithel und Drüsen des menschlichen Magens. München, 1881, Tfl. I.

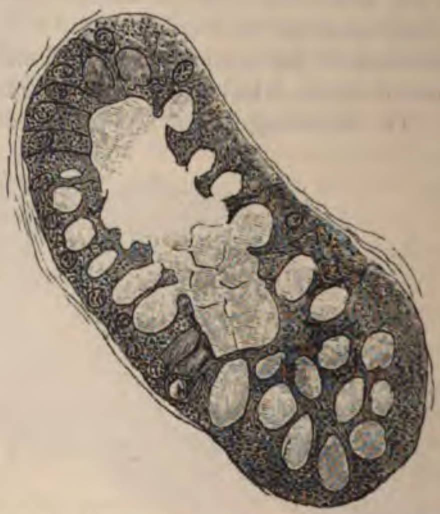


Fig. 20.—Herr L. This preparation came from the living mucous membrane in the neighbourhood of a resected pyloric carcinoma. The different stages of mucous transformation are visible in the epithelium, the nuclei of which are pushed against the edge. The mucus has in part escaped by bursting of the cell membrane into the lumen of the gland tubule, and has been precipitated in streaks by the alcohol. Hardened in alcohol, Heidenhain's staining with hæmatoxylin and chromate of potash.

in the description of the figure. That it is actually mucus and not an instance of the vacuole formation described by Stöhr and Sachs is shown very easily by its reaction with acetic acid and its blue coloration with hæmatoxylin, still these appearances are only met with in living mucous membrane put straight into alcohol; in other preparations I have not met with them. *There is a mucous transformation of the cell protoplasm right down to the fundus of the gland.* Whether the epithelium can be normally reformed, or whether a lasting change is the consequence of this process, the preparations before me do not permit me to say.

In its further course chronic gastritis gives rise at all events to retrogressive disorders of nutrition, which first lead to gradually increasing fatty degeneration of the gland cells, and later to a complete so-called *atrophy of the mucosa*, to which Lewy[*] especially has lately directed attention. He has given an impulse to further observations, for while Fenwick[†] had already carefully studied this condition, he had published figures which were, let me say it without reproaching the author, rather incomplete from the stand-point of modern requirements. Freund[‡] also, in a monograph rich in historical data, described these conditions under the name of granular degeneration of the gastric mucous membrane. The results of this change, which finally, when it involves great parts or the whole surface of the mucous membrane, must lead to a complete wasting of the secreting parenchyma with its consequences, appear to take two courses.[§]

In one series of cases the above-described degeneration of the gland cells resulted, together with small-celled infiltration of the inter-glandular connective tissue, in progressive destruction of the glandular parenchyma, so that finally, as shown in fig. 21, nothing remained but a very narrow layer of small round cells, between which here and there were found remains of the former parenchyma.

---

[*] B. Lewy. Chronische Gastritis mit Atrophie der Mucosa. Ziegler's Beiträge, Heft 1, 1886.—Ewald. Ein Fall von Atrophie der Magenschleimhaut. Berl. klin. Woch. 1886.—Westphalen. Ein Fall von hochgradiger relativer motorischer Insufficienz des Magens und Atrophie der Magenschleimhaut. Gastroenterostomie. St. Petersburger med. Wochenschr. 1890, No. 37.

[†] S. Fenwick, On atrophy of the stomach. London, 1880.

[‡] W. A. Freund. Ueber den état mamelonné und die Granularentartung der Magenschleimhaut. Breslau, 1862.

[§] I first described these conditions on the basis of preparations made by myself and Dr. G. Meyer, at a meeting of the Berlin Medical Society on November 14th, 1888. Berliner klin. Wochenschr. 1888, No. 49.

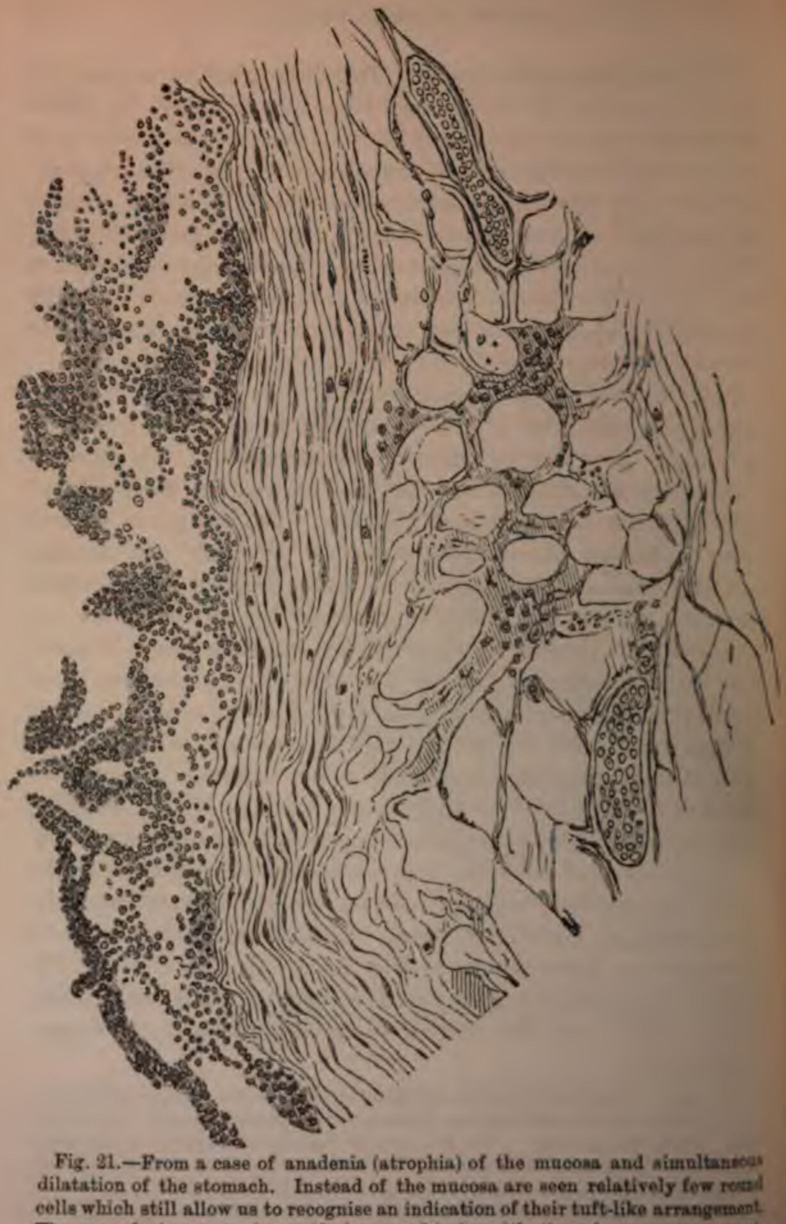


Fig. 21.—From a case of anadenia (atrophia) of the mucosa and simultaneous dilatation of the stomach. Instead of the mucosa are seen relatively few round cells which still allow us to recognise an indication of their tuft-like arrangement. The muscularis mucosæ is greatly increased in breadth, the submucosa torn apart. Its vessels greatly dilated and stuffed full of blood corpuscles. The muscularis, which is not shown in the figure, exhibits a peculiar splitting up of individual muscular bundles, the spaces in which appear to be filled up with a meshwork. (Camera lucida.)

Towards the stomach cavity the former glandular layer is bounded by numerous papillæ beset with round cells. Towards the submucosa, that is, in the deeper layers of the mucosa, we find in the earlier stages of the process that there are still some remains of oblique-lying gland tubules, which in part are changed into more or less large cysts, proving that the process passes from above downwards. Later on these remains disappear.

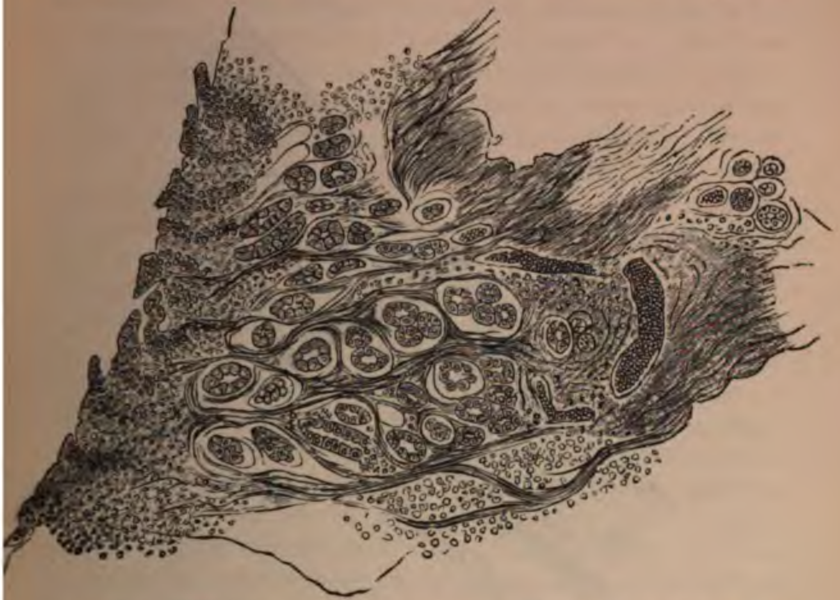


Fig. 22.—From a case of phthisis (atrophia) ventriculi with cirrhotic contraction. Broad processes of connective tissue pass up from the submucosa (on the right side of the figure) between the gland tubules, surrounding and compressing them, and destroying the parenchyma. In many places there are numerous round cells which surround the fundus of the glands, and lie between the meshes of the connective tissue. Towards the free surface of the mucosa there is a small-celled tuft-like infiltration. The muscularis mucosæ is absent. The submucosa is changed into a dense fibrous connective tissue, in which a few scattered remains of glands are to be found. (Camera lucida.)

The muscularis mucosæ is much thickened, the submucosa widened and drawn out into meshes, its vessels greatly dilated, without showing any particular changes in their walls. In the muscularis there is a peculiar widening out of the interstitial tissue between the muscular bundles. The organ is as a whole dilated, its wall is thinned in patches or in its whole extent, and is quite translucent. This is therefore a severe parenchymatous process developing from above downwards.

Another form is characterised by the marked participation of the interstitial connective tissue, leading to its hypertrophy, which develops at the bases of the gland tubules and passes upwards to the surface (fig. 22). The scanty fibres which run normally above the muscularis mucosæ are thickened and rise in tree-like branchings between the glands in the upper part, and surround and compress them. Still, unlike the first described form, cyst formation does not take place, but the parenchyma, cut off from its supply of nutriment, wastes, so that at last there is left, as fig. 23 shows, only a meshwork full of large holes, the fibres of which run parallel to the surface, and are cut clean off opposite to it.

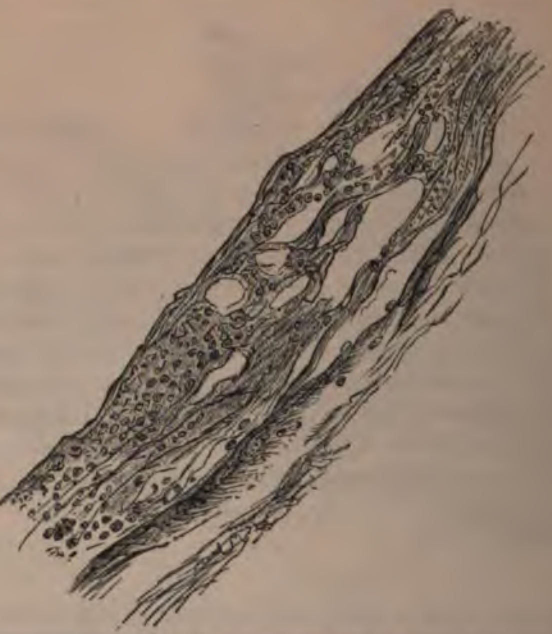


Fig. 23.—Complete contracting sclerosis of the mucous membrane, which is changed into a longitudinal fibrous tissue, through which are scattered a few round cells and remains of gland tissues. Towards the free surface of the former mucosa (on the right side of the drawing) a sort of dense limiting membrane is formed by the close approximation of the fibrous processes. The muscularis mucosæ is absent, the submucosa is atrophied and contains wavy bands of fibrous tissue. Cystic spaces are met with close below the free surface.

Some remains of tubules or of cells are found as collections of débris here and there. The muscularis mucosæ has completely disappeared, the submucosa is permeated by processes of connective tissue, the muscularis has apparently undergone no change. The organ as a whole is not only not dilated, but sometimes, as in a case of Nothnagel's,* it has undergone cirrhotic atrophy. We have examined such a stomach which could only contain 180 cc. (six ounces). The membrane replacing the mucosa appears to the naked eye smooth, white, grey, or slaty. The sclerotic contraction is, especially in certain cases, most marked at the pyloric region, whilst the wasting of the coats of the stomach occurs in irregular patches, especially near the fundus, or equally over the whole organ.

In any case it is a severe and irreparable process which mainly involves the glandular layer, and is distinguished by the complete disappearance of the secreting parenchyma. I can therefore only agree with Dr. G. Meyer, in wishing to call this process *phthisis ventriculi*, stomach phthisis, instead of atrophy of the stomach, a name based upon a false notion, and I propose the name *anadenia of the stomach* for its later stages, as it leads to complete destruction of the secreting parenchyma. But to describe it as *catarrhus atrophicans* or *atrophicus* is nonsense, and meaningless.

So much for these terminal forms of chronic gastro-adenitis.

Another change originates in the papilliform outgrowths between the gastric follicles, leading to polypoid growths which are generally the size of a millet-seed or a pea, and very often are in groups, but sometimes assume larger dimensions. Cruveilhier figures a preparation in which the polypi hang down from the mucosa like the teats of a young bitch. Ebstein † has carefully studied their structure, and divides them into pedunculated and non-pedunculated or sessile, occurring in groups and isolated, with smooth or shaggy mucous surfaces. In these parts the connective tissue between the glands is always increased, forcing them asunder. The mucosa and submucosa are extensively thickened. In a case of Lemaitre's he observed carcinoma and polypus in the same case, as well as amyloid degeneration of the vessels.‡

---

* Nothnagel. Cirrhotische Verkleinerung des Magens und Schwund der Labdrüsen unter dem klinischen Bild der perniciösen Anämie. Deutsches Arch. f. klin. Med. Bd. 24, p. 53.

† W. Ebstein. Die polypösen Geschwülste des Magens. Reichert's u. du Bois' Arch. 1864, p. 94.

‡ Camus-Corignon. Des polypes de l'estomac. Thèse de Paris, 1888.

Intestinal polypi are known to be not uncommonly the cause of partial or total intussusception, while such consequences of stomach polypi are most rare. Chiari * has, however, recorded a case of intussusception of the stomach wall which deserves special mention.

It occurred in a woman, aged 44, who had died of marasmus, in whom, during life, a tumour was found at the pylorus, vomiting and wasting were observed, and pyloric cancer with consecutive dilatation was diagnosed. On the outside of the anterior wall of the stomach there was a funnel-shaped depression, into which the middle finger could be passed for a distance of 6 cm. towards the pylorus. Into the funnel of this intussusception a part of the great omentum had entered, but was removed without any difficulty. On slitting up the stomach it appeared that the intussusception was caused by three large cauliflower-like polypi situated at the apex of the intussusception, and which formed a tumour as big as a hen's egg, reaching from the stomach through the pylorus for a distance of 2 cm. into the duodenum. Although the pyloric opening was not completely occluded, as the index finger could be passed by the side of the polypi into the duodenum, still there must have been a considerable amount of obstruction to the passage of food from the stomach to the bowel, and thus were completely explained the symptoms observed during life and the error in diagnosis.

The seat of the polypi just over the pylorus explains why they were drawn down by the strong contractions of the pylorus and intussusception of the stomach wall occurred, which, as above stated, would be very unusual in any other position of the polypi.

CAUSES.—*The causes of chronic gastritis glandularis* are manifold. Sometimes it is developed from the acute and subacute forms, which by repeated relapses lead to a chronic process, while, moreover, all causes of the former are causes also of the latter. The same disturbances act more readily when the glandular coat is in some sort prepared by abnormal conditions in the circulation or composition of the blood, and is more susceptible than normally.

To these belong all processes which give rise to venous hyperæmia of the organ, and all diseases affecting the portal system, especially of the liver and spleen, heart diseases and tuberculosis. By altering the composition of the blood the following debilitating diseases are probably predisposing causes —chlorosis, scrofula, anæmia after diarrhœa, typhus and enteric fevers, the acute exanthemata, pregnancy and childbirth, diabetes, gout, and chronic kidney diseases.

---

* A. Chiari. Ueber Intussusception am Magen. Prager med. Wochenschr. 1888, No. 23.

Finally, chronic catarrh is caused by direct local irritation either in consequence of scars and new growths on the mucosa, or by ulcer and carcinoma, or in consequence of irritating matter, which is persistently brought in contact with the lining of the stomach, and which is either introduced from without or excreted from the blood. To the former belong too large, half masticated and insufficiently insalivated morsels which irritate either directly and mechanically, or indirectly by favouring the putrefaction of the stomach contents. Further, the products of putrid decomposition in the mouth, which develop in consequence of defective teeth or inflammatory conditions in the gums, may be swallowed and become a direct or indirect source of inflammatory irritation. Also tobacco juice, which in many individuals leads at first to subacute and later to chronic inflammation, and the sharp irritants, alcohol in a concentrated form, condiments in food, which after long abuse give rise to chronic inflammation, and finally actual poisons or parasites, such as trichinæ, round worms, larvæ, &c. On the other side are certain toxic substances which are retained in the blood and are excreted in the stomach, such as, for example, urea in chronic renal disease, and the products of intestinal putrefaction in constipation.

The chief place among the causes of chronic gastritis must be assigned to injuries from ingesta, which for the most part are caused by our own fault, so that the patient is the primary cause of his disease. But as most men use their stomachs badly, that is, they are either disposed to sacrifice them to their culinary tastes, or at its commencement they do not encounter the disease with sufficient energy, chronic gastric catarrh belongs to the best fostered and widest spread of this world's ills. Indigestion is the remorse of a guilty stomach!

SYMPTOMS OF THE DISEASE.—*Gastritis glandularis chronica* offers in their well-expressed forms two easily distinguishable types of disease: *gastritis chronica simplex* (*catarrhus gastricus chronicus*), and *gastritis chronica mucosa* (*catarrhus gastricus* *mucosus*), both of which lead finally to atrophy of the mucosa. Although the symptoms of these different conditions have been long known and described, they have not been conceived as distinct and independent types, and we owe it to Dr. Boas* that we are able to distinguish by new methods of examination the atrophic from the mucous form, though perhaps he goes a little too far in regarding the latter as an independent form of disease. It constitutes only the terminal stage of the other. But simple and mucous catarrh are, however, connected by many intervening stages, so that a sharp distinction between the two processes is not possible.

The subjective symptoms in the early stages of the above-named processes are nearly the same, namely, those of difficult digestion, of chronic dyspepsia, and it is only when there is advanced phthisis (atrophy) of the gastric mucous membrane, and even, as it appears, only after its long existence, that the body begins to waste seriously and the patient to complain of some pain on pressure. But the differentiation of this condition is principally to be made by means of chemical examination. Let us first describe the whole of the ordinary phenomena, local and general. The patients complain generally of a stale, pasty, or saltish taste in their mouths, which is communicated to any food masticated. The tongue presents nothing characteristic. No doubt it is seldom clean but mostly coated, sometimes all over, sometimes only at the base, where the red and swollen papillæ project like strawberries, while it is impressed at the edges by the teeth; but there is entire absence as a rule of the thick felt-like coating which is almost invariably present in carcinoma. The tongues of anæmic delicate persons have a more regular transparent coat, and in consequence have a bluish white appearance. Sometimes an aphthous eruption develops at the edges, which is very disagreeable to the patient. In the morning the tongue is usually worse than at night, as the coating comes off in consequence of the movements of the tongue rubbing it off, and perhaps it may be noticed to remain in certain places, for instance, opposite gaps in the teeth. The lips are generally dry and cracked. Eructation is frequent, either odourless or of a foul acid smell, and with a disagreeable rancid taste.

---

* J. Boas. Zur Symptomatologie des chronischen Magenkatarrhs und der Atrophie der Magenschleimhaut. Münch. med. Wochenschr. 1887, No. 42.

The eructations are often accompanied by rising of fluid or remains of food, which tastes sour enough to set the teeth on edge, and which scalds the œsophagus; this is *heartburn or pyrosis*, the *ardor ventriculi* of Hoffmann. If it is limited to the lowest section of the œsophagus or to the region of the heart, and if it assumes a more intense character, it may be called *cardialgia.* An exact distinction between cardialgia and pyrosis is scarcely possible, as the Scottish physician Cullen described under the name of pyrosis a condition occurring among the inhabitants of that country characterised by paroxysmal severe cardialgia, coming on especially in the morning in fasting persons, and ending with the bringing up of watery fluid. At the same time it is necessary to distinguish *cardialgia* by the localised position of the pain corresponding to the position of the heart, beneath the line uniting the body of the sternum and the ensiform process at the level of the costal cartilage of the seventh rib, from *gastralgia*, and we must not employ the expressions cardialgia and gastralgia indifferently, as is frequently done in older books. But wherever this heartburn is met with, whether in the whole length of the œsophagus, or only at the cardia, or when acid matter, without any special scalding of the œsophagus, rises into the mouth, it is always necessary to observe its nature and to distinguish clearly between the sour matter which is acid from the products of fermentation and decomposition (acetic acid, fatty acids, lactic acid), and that due to increased acidity of the normal gastric juice, from excessive secretion of hydrochloric acid, and finally those to a certain extent paradoxical cases in which in spite of the symptoms of pyrosis, the acidity and composition of the stomach contents are, as MacNaught* has shown, normal. Only the first of these forms, which was discovered by Groves in 1823, occurs in the course of chronic gastritis; the others constitute neuroses, in which occasionally there is such a marked intolerance of acids, that as Talma† has observed, the introduction of a solution of hydrochloric acid of normal or subnormal acidity, produces in nervous persons the symptoms of pyrosis and cardialgia. Vomiting is a very inconstant occurrence, and the nature of the vomited material depends upon the temporary state of the disease, so that it contains sometimes more, sometimes less of the products of digestion and decomposition. Nausea and grinding the teeth generally precede it. The appetite is usually small or entirely absent, but with varying changes for better or worse, so that the patients when they are better commit dietetic errors, which set up renewed irritation. Many patients go to table with appetite, but are satisfied after a mouthful or two; others verify the saying, "L'appétit vient en mangeant." Whilst in the last case the irritation which is set up in the gastric mucous membrane is quite sufficient to cause the glands to secrete, it is in the first case too strong for the irritable gastric mucous membrane, and perhaps it stops secretion by causing an abnormal hyperæmia. Most patients have no special thirst, but have a longing for acidulated or refreshing drinks, and take a good deal during meals. After eating the feeling of weight and distention comes on. The patients have no special spontaneous pain in the region of the stomach, rather a choking, undefined sensation, which is so increased by pressure as to be slightly painful, whilst typical gastralgia is not an ordinary occurrence, and therefore when it does appear, it always suggests the existence of some other concurrent disease. The patients often have the feeling that the food remains abnormally long in the stomach, and we frequently hear described very forcibly how uselessly the stomach labours to discharge its contents into the bowel. In fact, as soon as these conditions have lasted some time, there is always associated with them an enfeeblement of the muscular wall of the stomach, *atony of the stomach*, which leads to prolonged retention of food in the stomach. In consequence of this, products of decomposition are formed in the ingesta. The products of acid fermentation occur when carbo-hydrates are present in the stomach, while the putrefaction of albuminous material gives rise to what Escherich has called alkaline fermentation. As a result, we get distention of the organ by gas, eructation of foul-smelling gases, and bringing up of acid and rancid matter. The distention of the stomach has a paralysing effect on its muscular wall, and causes tension and pain; the spoiled or improperly prepared stomach contents irritate the intestine, and this result reflects on the stomach, so that we find ourselves again in the vicious circle which is formed in all diseases of the stomach. The *atonic state* of the muscular wall, resulting from chronic catarrh, is one of the most prominent causes of the symptoms complained of by these patients. That these conditions lead finally to dilatation of the stomach, to genuine gastroectasy, has been already explained, but it may be stated here that it occurs especially towards evening, being absent or slight in the morning.

---

* MacNaught, Medical Chronicle, Jan., 1885.

† Talma. Ueber Behandlung der Magenkrankheiten. Zeitschr. f. klin. Med. Bd. 8, p. 407.

The bowels are generally constipated, only rarely regular, in some cases varying between constipation and diarrhœa, and if, as frequently happens, hæmorrhoids are present, the motions are accompanied by pain and hæmorrhage. The fæces are sometimes light, sometimes dark greenish black, and very evil smelling, and contain the remains of undigested food. The patients have the distinct sensation of insufficient emptying, and suffer from severe flatulence and rumblings, which are sometimes so loud as to be audible at a distance. It frequently happens that the stools are not properly fæcal, but rather watery, or watery and slimy, caused by the irritation of the mucous membrane of the bowel by hard scybala, and if a rectal examination is made, hard masses can be felt which, owing to paresis of the muscular wall of the bowel, cannot be expelled. The urine is scanty, with a copious deposit of urates, and is sometimes alkaline from the presence of basic salts. Unfortunately we do not possess an exact investigation into the nature of the modifications in tissue metamorphosis as shown by the excretion of the kidney, although our recent knowledge respecting the formation of alkaloids in the organism offers certainly a fruitful field for inquiry.

The general symptoms consist of diminished mental activity, disinclination for hard work, slowness of ideas, drowsiness during the day, especially after eating, headache or heaviness of the head, and a peevish, easily irritated temper. Complaints are often made of heaviness in certain limbs, of coldness of the extremities, of itching, and formication. Sleep is profound, longer than ordinary, not refreshing, and disturbed by unpleasant dreams; frequently yawning is associated with a disagreeable contraction in the mouth and increased secretion of saliva, the patients hawk a great deal, and bring up a thick mucus containing blackish lumps. This is the so-called *stomach cough of dyspeptics*, which indeed has no more to do with the stomach than that the pharyngeal catarrh, which is the cause of it, is due to the same causes as the stomach catarrh, namely, the abuse of irritants, especially of an alcoholic kind.* It happens at other times that the acid stomach contents are regurgitated and irritate the catarrhal pharyngeal mucous membrane, so that coughing is caused at the crossing point of the œsophagus and bronchi. Such coughs may be made to disappear by neutralising the acid gastric contents.

The pulse is small and feeble, sometimes intermittent, and irregular action of the heart is experienced by the sensations of the patient as palpitation. Many patients have a specific smell, which is communicated to the body linen and increases with each exacerbation. In the evening there is some tendency to fever even in chronic catarrh, which has led to the employment of antifebrile treatment, and even to confusion of the disease with enteric fever.

Not in all cases, gentlemen, indeed not once in a lifetime, do we meet with all the above-described symptoms. Some patients complain only of distention of the belly and great difficulty of breathing, constituting the group of symptoms described as *asthma dyspepticum*. Other patients are chiefly affected by stomach cough, loss of appetite, acid risings, chokings, and burnings in the belly. Still in others we have principally irregularity of the heart's action, palpitations, and arhythmic intermittent pulse, giving rise to apprehensions of organic heart disease. These occur chiefly during digestion, are associated with pulsations in the epigastrium, and pass off when the stomach contents are emptied into the bowel, or a diminution of tension has occurred by eructation of gas. Henoch † has described a variety of this *dyspepsia cardiaca*, and recently O. Rosenbach ‡ has given it a certain renown under the title "On a group of symptoms probably depending on a neurosis of the vagus" (vide Neuroses). Commonly all there is, is the slight painfulness *in loco affectio* is spontaneous or felt on pressure in the epigastrium, and the char g in the chemical course of the digestive process.

We must also mention here that peculiar condition which w first described by Trousseau as *vertigo gyrosa*, or *vertigo a stomacho læso* (*vertigo stomachalis*), about the same time by Brück of Osnabrück [*] as *aura vertiginosa*, and which afterwards has been more deeply discussed by Blondeau, Niemeyer, v. Basch, Westphal, Cordes, Eyselein, &c. Trousseau's service was that he first pointed out the connection between attacks of giddiness and chronic catarrh of the stomach. They occur without loss of consciousness, and usually some time after taking food, on the other hand they are sometimes cut short by it, but they are not caused by rapid rotatory movements, or by stooping the head. These accidents disappear after rest and careful diet, but are generally followed by severe headache. Sometimes they take the form of agarophobia, and have been described as such by the above-named authors. The patients express, as is well known, an extravagant fear; it is impossible for them to go alone into large open fields, squares, or broad streets, and they either altogether avoid such places, or they seek the company even of a stranger. Whether such conditions come within the range of the slighter psychoses or not, they are in any case not to be regarded as neuroses of the stomach in the sense of constituting a disorder of the stomach caused directly or indirectly by nervous influences, but they are the reflection of an organic disease of the stomach on the brain, and are clearly to be distinguished from the conditions to be described later on as nervous dyspepsia. For the explanation of them we may, with Mayer and Pribram, accept an increase of pressure in the cerebral vessels from irritation of the coats of the stomach, or with Bernstein and Asp, prefer to believe in irritation of the splanchnics.

---

* A true "stomach cough," that is, due to reflex irritation of the gastric muc membrane, has not at present been proved to exist, and is directly denied by su important authors as Naunyn, Nothnagel, and Edleffsen. Recently E. B (Deutsches Arch. f. klin. Med. Bd. 41, p. 472) has described a case of paroxys of cough originating reflexly from the mucous membrane of the stomach.

† l.c. p. 391.

‡ O. Rosenbach. Neurose des Vagus bei Dyspepsie. Deutsche med. Woc enschr. 1879, Nos. 42 and 43.

As these conditions are not common, the following histories will serve to illustrate them. They occur in men of middle age, as the disease is especially noticed in them, and the patients in fifty-four cases recorded by Cordes[†] were aged from 19 to 47. They commonly have chronic gastric catarrh, and the agarophobia disappears when this is cured.

The first case was that of a captain in the army, who came to me complaining only of a little local stomach pain, and occasional slight headache, but added that for some time he had experienced a genuine fear when walking or riding in large open spaces, so that he was not able to go upon the parade ground; indeed, when on one occasion he rode across it he was seized in the middle with such fear that he had to dismount and lead his horse by the bridle, when he went across without further discomfort.

---

[*] Brück. "Vom Schwindel," Hufeland's Journal. Bd. 17, p. 5.

[†] Cordes. Westphal's Archiv. Bd. iii. p. 521, and Bd. v.

34

The second patient also an officer, who was employed in the War Office, described his condition as being one of great fear on a quite smooth empty floor. He could not walk across empty parqueted rooms, and it was very disagreeable and strange to him to walk on smooth asphalte, so that he either took another way or looked for some one to go with him.

The third, a ministerial functionary, was obliged in his daily walk to the office to pass through a large square. By degrees the feeling came over him that it was impossible for him to walk across it, the ground rocked under him. If he tried to walk across, after a few steps he became so giddy that he felt he should fall, and he was obliged to abstain from the attempt.

In all these cases the psychical symptoms completely disappeared as the gastric phenomena improved under the influence of improved regimen.

As I have already stated, the distinction between these two or three groups of chronic gastritis is not so much to be made by subjective or objective symptoms without chemical examination of the stomach, but especially by means of accurate testing of the digestive conditions. To avoid repetition I will go into details under the head of diagnosis. A word may find a place here upon atony of the stomach, already referred to.

The conception and the name of *atony* have been so long familiar in the pathology of the stomach that it does not appear to me to be right to describe under this name a new clinical condition, as v. Pfungen* has done. We understand by atony what the name implies, namely, a deficient tonus of the muscular wall and its resulting insufficient activity, a mechanical or muscular insufficiency of the stomach, which cannot be attributed, as it has been by some authors, to disorders of the glandular function. The atony is either idiopathic or deuteropathic, primary or secondary, as we now say. Primary atony, gentlemen, is only met with as a neurosis, and is a very uncommon occurrence. But secondary atonic conditions accompany almost all affections which involve the gastric mucous membrane to a large extent; indeed, we may say that the principal objective disturbances are caused by atony, and before the tonus of the muscular wall is lost the ill effects of insufficient secretion or incomplete absorption are compensated for by muscular action, that is, by efficient transference of the ingesta into the bowel. But it occurs in conditions of general debility, which cause not only torpor and insufficiency of one organ, but of the whole tissue metamorphosis, and which especially occur in the developmental period of life, such as rickets and scrofula in children, phthisis, chlorosis, &c. The large distended abdomen of the scrofulous child is the classical sign of the condition. There is atony of the stomach and intestine, with manifold secondary disturbances of digestion and nutrition resulting therefrom, in many of these patients, giving rise sooner or later to dilatation of the stomach, as we have already explained. The atony in these cases is no primary disease, but the consequence of a general dyscrasia. It is only primary in the sense of its relation to other gastric derangements. In this way atony of the stomach acquires great importance, as was shown by Rosenbach in a thorough statement of the case under the title, "The Mechanism and Diagnosis of Insufficiency of the Stomach," and by Pfungen in the already quoted work, in which he has treated it most comprehensively and from all aspects, all the more as the primary forms reflect their mechanical changes on the chemical and other functions, just as the latter lead to disturbances of motion. So it happens that in severe cases of chronic gastritis the salol test shows a retardation of the passage of chyme into the bowel, whilst in slighter cases this is normal. Moreover, we can in this way explain what I have already referred to—the absence of symptoms of dilated stomach so long as the muscular wall retains its power and the salol test indicates that there is normal expulsion of the stomach contents. Therefore we shall still leave it undecided whether, as appears from recent observations, we have to do with a special disturbance of the peristalsis of particular portions of the stomach, the fundus and pyloric portions, a question which is quite irrelevant for our present purpose, but on which we shall have something to say when we discuss atony as a nervous affection. In the cases now before us atony is only secondary, occurring in the pathological course of the disease, so that, however important, it is only a symptom and not a special disorder. There are constitutional causes which make it occur in some sooner, in others later, in some more marked, in others less marked, in many (compare the experiences of Wiederhofer, Kundradt, Comby, and others) reaching back to their childhood. But whether atony is primary or secondary, its consequences are in either case relaxation and dilatation, which, as Poensgen remarks, *cæteris paribus*, develope with ease in proportion to the laxity of the anterior abdominal wall, and as it can offer less support to the stomach.

---

* R. v. Pfungen. Ueber Atonie des Magens. Wien. 1887.

The final stage of chronic catarrh, *atrophy of the mucous membrane*, or, as we should say, *anadenia of the stomach*, already mentioned, is of great interest, as it is not so much a disturbance of nutrition affecting the structure of the tissue as a complete disappearance of the glandular parenchyma, which may be described as *phthisis mucosæ*, or less correctly as stomach phthisis. This anadenia may be partial or total. In the latter case only is it of great importance, as otherwise the failure of a circumscribed portion of mucous membrane is compensated for by the remainder. As follows from the above anatomical statement, we find a gradually progressive destruction of the secreting elements which must lead to complete cessation of secretion, so that the digestive activity of the stomach is completely and irremediably annihilated. The consequences of this process and condition are obvious. After a more or less protracted stage of dyspeptic pains there finally develops such severe disturbance of nutrition that the patient dies like a flame that wants oil, and perishes from marasmus. At the same time we have had many experiences which show that in these cases of failing stomach-digestion the intestine can step in and undertake the whole work of assimilation. But this seems to be only possible for a certain time, which varies in different persons, as sooner or later it gives rise to pathological processes in the intestine which destroy its functions, either in consequence of too great strain or of other accidental conditions. Then the compensation suddenly ceases, and there is a development of an apparently acute disease. The conditions do not differ from those of other organs. We know at least of none of the paired organs of vegetative life which are deeply concerned with the economy of the body, where one can for an unlimited time compensate for the absence of its fellow. For a limited time they may, but not for more. This is the case with the lungs and the kidneys. It is the same for the various portions of the intestinal tract; we cannot feed a man permanently by the rectum; we cannot permanently do without the stomach, which is not simply a place for digestion or disinfection, but is a vitally important organ. The greater or less disturbance of the general state of the patient within this given time depends upon how far the motor function of the stomach, that is, its capacity to pass on the ingesta to the bowel, is preserved or not; in other words, whether the muscular wall is intact, or paretic (ectasia), or increased in activity (hypertrophic cirrhosis). But, finally, this vicarious function becomes paralysed; perhaps by atrophy of the intestine, though facts to prove it are wanting; symptoms of imperfect blood formation set in, in the likeness of pernicious anæmia, if not with such a gradual extinction of life, and death follows from "senile decay." I have convinced myself in the *post-mortem* room that many persons dying with the diagnosis of senile decay present extensive anadenia, generally combined with dilatation of the stomach. The resemblance of the disease to pernicious anæmia has been pointed out by Fenwick, Bartels, Osler, and Scheperlen.* Rosenheim † has observed two cases with the aspect of pernicious anæmia. In these cases there is indeed a distinct alteration of the blood, change of the red corpuscles, relative increase of the white, formation of macro- and microcytes, so that it might be asked whether pernicious anæmia was ever an independent disease or more than a consequence of anadenia of the stomach, if Quincke and Immermann in their cases of pernicious anæmia had not found that the changes in the stomach were insignificant in comparison with the intensity of the blood changes. It is very remarkable that many observers (Fenwick, Ewald, Nothnagel) have noticed the well-preserved state of the adipose tissue, but it is known that in blood diseases, in consequence of diminished oxidation, this preservation of fat is not infrequently met with.

---

* S. Fenwick, l.c.—Bartels. Ein Fall von perniciöser Anämie mit Icterus. Berl. klin. Wochenschr. 1888, No. 3.—Scheperlen. Studier angaaende Anaemie. Nord. medic. Arkiv. 1879, Bd. xi. No. 3.—Osler. Atrophy of the Stomach with the clinical features of progressive pernicious anæmia. Amer. Journ. of Med. Sciences, 1886, No. 4

† Th. Rosenheim, l.c.

It is in the nature of things that elderly people are especially liable to this result of chronic gastritis, because in youth the tissues possess a greater compensating and restoring energy. Most cases are in persons on the other side of forty. Litten, Einhorn,* and myself, have seen cases at earlier periods of life, from eighteen to twenty-eight years of age, but they were not verified by *post-mortem* examination, being still alive. One of my most striking cases is that of a young man, aged 28, whom I first saw eighteen months ago, complaining of obscure dyspeptic disorders, weakness, and loss of weight. He never had a trace of hydrochloric acid in his stomach contents, nor any peptic ferment, and it was impossible to obtain any evidence of it by introducing a weak solution of hydrochloric acid into the stomach, and removing it after a certain time, a test which gives almost invariably a positive result in a healthy stomach, as pointed out some years ago. This man takes every day 3 grms. of hydrochloric acid, Ph. Germ. (25 per cent. solution of pure HCl), and he has improved so much that he now feels quite well, and works all day. He never has had any swelling of his lymphatic glands or any tumour. I saw him the last time a few weeks ago, and again I failed to detect any gastric secretion. I cannot believe that the hydrochloric acid acts in this case as an aid to digestion, but I think it hinders putrefaction, prevents decomposition, and so preserves the patient from their consequences. The tonus of the muscular wall of the stomach is quite sufficient to expel the contents in due time into the intestine, where the real process of digestion commences, and is performed effectually.

DIAGNOSIS.

Diagnosis is concerned first to distinguish gastritis from other diseases, and secondly to separate its various forms from one another. Chronic gastritis is such a frequent concomitant of the most different local diseases of the stomach, that we must set aside these secondary occurrences and consider only the genuine forms. But it follows from the conditions of the disease as already described, that the diagnosis of such a genuine gastritis can only be made *per exclusionem*, that is, we must exclude the other organic and functional diseases of the stomach. We can only affirm the existence of idiopathic gastritis, after we have set aside the possibility of ulcer, or cancer, or dilatation, or nervous disease, or any of the acute affections mentioned in the previous chapter. What remains is Gastritis! and easily made as the diagnosis of "chronic gastric catarrh" ordinarily is, this hasty decision is based on so small a ground, and in so many cases is never justified. The clinical symptoms of chronic gastritis hide themselves sometimes under the above-named affections, and neither the duration of the disorder, nor the kind of pain, nor the etiology can by themselves suffice for the diagnosis; we need for this a careful examination with all the assistance supplied by modern technical methods. When in this way the existence of gastritis is ascertained, we have to distinguish the various forms. For this the examination of the stomach contents is essential.

---

* **M. Litten and Rosengart. Ein Fall von fast völligem Erlöschen der Secretion des Magensaftes (Atrophy of the gastric mucous membrane of the text-books). Zeitschr. f. klin. Med. Bd. xiv. p. 573.**

The facts may be arranged in the following order:—

1. *Simple gastritis.*—In fasting stomachs there are only small quantities of watery mucus, often coloured yellowish green or yellowish by the bile, and mixed with duodenal contents, which on standing deposit a sediment of epithelium of various forms and sizes, of numerous round cells and free cell nuclei, also small amounts of remains of food, starch grains, muscle fibrilli, and vegetable cellular tissue. After the test breakfast, variable but never increased acidity, hydrochloric acid diminished. Pepsin and rennet ferment weak; peptone and propeptone are found in the stomach, it digests on the addition of acids. It contains chiefly lactic acid* and fatty acids, but there is no absolute rule as to this.

2. *Mucous gastritis.*—This is distinguished from the simple form by the abundant mucus met with even in the fasting stomach, and especially after food, so that with acetic acid there is a copious precipitation of mucin. Acidity always low. Hydrochloric acid generally quite absent. Propeptone very abundant, peptone only in traces. Test digestion occurs only after adding hydrochloric acid, and is then prolonged. The milk curdling action is delayed or absent. In the water with which the stomach is washed out

---

* By "absence of lactic acid," I understand that neither the filtrate of the gastric contents nor its extract made by shaking with three volumes of ether, reacts with Uffelmann's reagent. Vide supra p. 244 et seq.

there are here and there small, often blood-tinged, fragments of the epithelial covering of the mucous membrane.

3. *Atrophy.*—This is distinguished from the two conditions already described by the fasting stomach being ordinarily empty, and the stomach contents after the test breakfast being free from mucus, while hydrochloric acid, pepsin, and rennet ferment are completely absent. The proof that no pepsin is secreted requires some precautions. Jaworski* very justly remarks, that it is not sufficient to add to the stomach contents which contain no hydrochloric acid a few drops of the acid, before commencing the examination of the digestive action by which the absence or presence of pepsin is to be determined. We must add so much acid that the presence of *free* acid is shown by the colour reaction; only then is the positive or negative result of the examination decisive. I have for a long time always proceeded in this way, and I confess that it seems to me to need no discussion. As hydrochloric acid is a distinct stimulant for the secretion of pepsin, or for the conversion of pepsinogen into pepsin, in cases of deficient hydrochloric acid secretion, it is well to do as Jaworski recommends, if we wish an absolute proof of the absence of pepsin, viz., to give half an hour or so before the use of the siphon 200 to 300 cc. of diluted hydrochloric acid and then to examine the digestive capacity of the fluid withdrawn, by which means, and with the use of properly diluted tests, we may arrive at a very just estimate of the amount of pepsin present.

Where the stomach is completely degenerated we find no formed elements of the gland parenchyma in its contents, only a few wasted round cells and micro-organisms.

On the basis of these facts we may, as a rule, easily distinguish these forms from each other, although, as already mentioned, there are intermediate forms between the first and second which cannot be distinctly classed in either category. The great diagnostic difficulty is, however, to distinguish atrophy or anadenia of the stomach from complete suppression of gland function in nervous disease and from carcinoma. The former is usually possible on account of the facts that the neuroses are more common in young and middle-aged persons, and are subject to remissions, while atrophy occurs in elderly people and is permanent. For some time I have had under treatment a young man who constantly presents the chemical signs of atrophy, but his general condition makes us class him with nervous dyspeptics. It is much more difficult to differentiate cancer from atrophy by chemical examination, provided that the ordinary features of cancer, viz., tumour, enlarged lymphatic glands, general cachexia, and hæmatemesis are absent, because in both there is loss of hydrochloric acid, pepsin, and rennet ferment. I have been able to get some help in the diagnosis of carcinoma from a very important occurrence, I mean the condition of the stomach contents; these are frequently bloody in cancer, or are blood-tinged from admixture with old blood-colouring matter; this occurs even when there is no vomiting of blood, but is never met with, so far as my experience goes, in anadenia of the stomach.

---

* Jaworski. Zur Diagnose des atrophischen Magenkatarrhs. Verhandl. VII Congresses f. innere Med. Wiesbaden 1888.

COURSE AND PROGNOSIS.

Its name tells us that chronic gastritis is a disease of long duration. This is on account of its tendency to relapse, or, perhaps more correctly, to undergo exacerbations. Even in apparently cured cases there often remains such delicacy of the organ, that the slightest injury, or merely departing from a specific diet, brings on a new attack of the disease. Therefore the prognosis in chronic gastritis must not be made too lightly, because, if prolonged, it leads to atrophy and anadenia, which is an incurable and fatal disease. A great part of the cases, which, according to the ordinary tables die of senile decay, in reality perishes from atrophy of the stomach, only this disease is frequently ignored because its symptoms have been little known, and the macroscopic changes in the stomach are not well marked. Chronic gastritis, finally, is to this extent a disease which must not be under-estimated, as the disturbances of nutrition connected with it, and the resulting tissue degeneration, render the organism less capable of resistance and more liable to a number of other sources of evil, of which I need only name tuberculosis and acute rheumatism. It is certain, on the one hand, that tuberculosis leads to gastric catarrh, and it is equally probable, on the other, that gastric catarrh does not originate the predisposition to tuberculosis, but when that is once present, it favours and increases it.

TREATMENT.

We must distinguish three groups of therapeutic agencies. First, those means by which we add to the stomach the deficient digestive material, then those which can stimulate the sluggish functions of the stomach, and finally those which aim at preserving it from harm introduced from without.

To the first belongs the employment of hydrochloric acid, and of pepsin, and of the so-called pepsinogenous substances. So far as the latter are concerned, the therapeutic action of which rests* upon the influence urged by Schiff and Herzen of certain (peptogenous) substances (bouillon, dextrine, bread crumb), I have already explained that I can only accept a peptogenous, or more properly pepsinogenous action in the stimulus which, like other food, they afford to the glands, so that they fill the stomach with an actively digesting fluid, which exerts its peptic activity effectually on any subsequent food taken. However, Dujardin-Beaumetz † suggests an "elixir peptogène" made of dextrine 10 parts, rum 20 parts, and syrup 180 parts, while Labastide ascribes the action of peptone enemata in suddenly removing obstinate anorexia to the introduction of peptogens.

Hydrochloric acid is of the greatest importance in the treatment of chronic gastritis, because it not only replaces the deficient secretion of the glands and forms the necessary acid albuminate for peptonisation, but it prevents organic fermentations, or limits those already existing. So says Heberden, obviously referring to organic fermentations, "Potus acidi non semper nocent ægris acore ventriculi laborantibus nonnunquam etiam auxilio sunt"; and Pemberton expresses himself to the same effect. As this control of fermentation only occurs with hydrochloric acid, we must not employ, as some authors permit, lactic acid or citric acid, which have no antifermentative action. In all these cases, where we have to do with a diminished or completely abolished secretion of hydrochloric acid, that is, in all cases of chronic gastritis, we should give hydrochloric acid, best in the form of ac. muriat. dil. of the Pharmacopœia, in considerable quantities, and at times in larger doses than one usually employs. As Jaworski says, quite astonishing quantities of hydrochloric acid may be introduced into the stomach without any injury to it, so that I give it in as concentrated watery solution as possible, that is, as acid as the patient's mouth will stand, three or four times every quarter of an hour after eating; and in order to prevent the acid in time affecting the teeth, it should be drawn up through a glass tube, or pills may be made out of bolus alb., and a few drops of dilute hydrochloric acid, of which five or six should be taken with a glass of water. I have used this treatment for months without any bad effect.

---

* Vide part I. p. 92. A. Herzen. Altes und neues über Pepsinbildung, Magenverdanung, und Krankenkost. Stuttgart, 1885.

† Dujardin-Beaumetz. Journ. de thérap. 1880, p. 828.

Pepsin has been for a long time combined with the use of hydrochloric acid, chiefly, I may say, with the idea that if it does no good it does not do any harm. We know now that pepsin is present in a great number of cases, even where no free hydrochloric acid can be demonstrated, and that, as has been shown by Jaworski,* and confirmed by me in a case with permanent loss of free hydrochloric acid, pepsin can be extracted by hydrochloric acid from the glands of the human stomach. We may then limit the administration of pepsin to those cases in which its absence has been actually ascertained, to advanced cases of mucous catarrh and to atrophy of the stomach. It should be given in large doses of 0·5 to 1 grm. (7½ to 15 grains), dissolved in hydrochloric acid and water, about fifteen to twenty minutes after meals, because although very small quantities of pepsin can liquefy large amounts of albumen, the artificial preparations of pepsin are largely diluted with milk sugar, and only a part of them ever acts, a certain amount being very soon passed into the intestine. It seems to me that, theoretically, where there is neither pepsin nor hydrochloric acid, we might give pancreatic ferment, but practically it is found to be without effect. Dr. Hagewinkel, of the Hague, has tried it at the Augusta Hospital under my care, using various preparations of pancreatine, but he was unable to arrive at any distinct result.

The second group of medicaments aims at stimulating the glandular function. In the first place stands washing out the stomach, which, if we except dilatation of the stomach, is never followed by such good results as in these cases. This is equally true in simple chronic gastritis, and in the mucous form. We may combine the stomach douche with the washing, which must be continued till the returning water is quite clear, and finally we may leave in the stomach a certain quantity of water, to which some medicament has been added.

---

* W. Jaworski. Die Wirkung der Säuren auf die Magenfunction des Menschen. Deutsche med. Wochenschr. 1887, Nos. 36 to 38; and ibid. Methoden zur Bestimmung der Intensität der Pepsinausscheidung. Münchener med. Wochenschr. 1887, No. 33.

The beginning of the washing should be always performed with pure hot water, and towards the end, according to circumstances, an alkaline or an antiseptic solution may be used. The former, when the amount of mucus is very large, the latter when putrefactive processes prevail. We have the advantage in this method that we can administer much larger quantities of nasty or irritating substances than in the ordinary way *per os*, because they can be immediately withdrawn. Even after a small number of washings, after eight or ten applications of the method, there is remarkable easing of the pain and improvement of the local processes. I could relate to you a great number of cases in point, but I will refrain, because they do not present any special points of interest, but I repeat that cases which had resisted the ordinary treatment for months and years, have improved, and even become cured by washing in a remarkably short time; but I must not forget to mention that besides the washing otherwise rational treatment was carried out, where the condition of these patients made it impossible to employ the washings regularly. I no longer meet with any opposition on the part of the patient to the much decried "stomach pump," since this conviction of the necessity of the modern examination and treatment of stomach diseases has gained more and more ground. I replace it by making the patient drink every morning, on a fasting stomach, great quantities, up to half a litre, of a 1 per cent. solution of common salt, at 42° C. (107·6° F.), or Wiesbaden, Kochbrunnen, or warm Rakoczy water. But these are none of them sufficient. The beneficial action of the washing out depends upon the facts that the stomach is freed from the remains of food which have rested too long in it, that excess of mucus is removed partly by chemical, partly by mechanical means, and that the irritation connected with the introduction and withdrawal of the tube not only stimulates peristalsis and thereby strengthens the muscular activity of the stomach, but also favourably influences the glands, or as Oser says, "produces a healthy reaction." Common salt in this connection is not without importance, in spite of Pfeiffer having shown that on adding it to artificial digestive mixtures, their digestive capacity was diminished. The researches of Braun and Grützner, as well as those of Boas, which have united to show that common salt introduced into the blood increases the secretion of the gastric glands, appear to me to be more convincing on many grounds * than such experiments in incubators. At any rate the experience of Wiesbaden and Kissingen, and our daily use of this salt, speak against such a view. In cases with enfeebled muscular walls I have seen great good result from daily faradisation by means of the tube electrode introduced into the stomach, which has been previously filled with water. It not only contracts and strengthens the muscles so as to make the organ empty itself in proper time, but it also stimulates glandular secretion.

As stimulants of the glandular secretion the long reputed bitters and carminatives may still be accepted, although recently Tschelzoff in the dog, and Jaworski † in man, seem by their experiments to have proved the opposite, namely, that they diminish secretion. On the contrary, Marcone ‡ has quite recently published a series of experiments, which seems to re-establish the old reputation of bitters and carminatives, as he succeeded in proving an augmentation of the secreted gastric juice. There may be very different results according to the intensity and extent of the gastritis and the reactive capacity of the glandular parenchyma. The effects of quassia, gentian, kino, calumba, camomile, vermuth, peppermint, &c., and more recently of condurango bark, have been seen by too many and too good observers to rest only on self-deception. I have personally verified the effects of quassia and condurango bark, which I give always in combination with hydrochloric acid, so that the mixture forms a 0·2 per cent. solution of the Pharmacopœia acid. It is possible—and this may form the subject of future investigation—that these remedies chiefly act by stimulating the tonus of the muscular wall, and so compensate for diminished secretion. A special action on the tonus of the muscular wall has been attributed to nux vomica or strychnine, and to belladonna, especially in drunkards and people with enfeebled nervous systems. This is certainly confirmed if we do not limit ourselves to the ordinary small doses but give large amounts. The use of belladonna is described on page 421. I willingly combine the tincture of nux vomica with an infusion of one of the above-named stomachics, and measure the dose so that a tablespoonful contains at least ten drops, that is, 5 to 150 of the infusion; or I give the mixture with belladonna as follows: ℞. Tinct. belladonnæ 5·0, tinct. strychn. 10·0, tinct. castor. canad. 10·0, M.D.S.; twenty drops five or six times daily. According to English practice we may add ipecacuanha in small doses of 2 to 3 cgrm., combined with the same amount of ext. nucis vomicæ, and give a powder thrice daily half an hour before meals. We must also mention here the hydrotherapeutic means, cold rubbings, douches to the stomach, &c., to which the ancients attributed much importance under the name of cataclysmata, and massage. Apparently the use of alkaline water is quite irrational, though it is recommended by Germain Sée to be taken an hour before meals. But since, as Jaworski has shown, water containing carbonic acid gas stimulates chemical action and absorption, and the alkaline waters generally contain this gas, this action may be well founded, whilst, on the other hand, they neutralise excess of acid.

---

* Vide Part I., p. 196.

† W. Jaworski. Experimenteller Beitrag zur Wirkung und therapeutischen Anwendung der Amara und der Galle. Zeitschr. f. Therapie, 1886, No. 23.

‡ Marcone. Riforma med. June 8, 1891.

The regimen of dyspeptic patients begins in the mouth. We have mentioned already under the causes of gastritis two important factors—the care of the teeth and leisurely eating, that is, the sufficient comminution and insalivation of the food in the mouth. Although recently the care of the teeth even in the middle classes receives much more attention than formerly, still one often meets with gross want of cleanliness in the mouth. I do not speak of badly brushed teeth loaded with tartar, carious teeth, or diseased alveoli and inflamed gums, with a thick, greenish-white coating of shed epithelium, fungus fibres, cocci, and remains of food between the teeth. These are manifest improprieties which are easily seen; but we should recommend our patients (and the healthy too) to wash out the mouth after each meal. Less obvious are the dirty palate plates of the now very common artificial teeth, or the plates attached to old stumps. Kaczarowski has perhaps somewhat exaggerated this matter, but in many cases he is right. Not long ago I attended a gentleman with intense mucous catarrh of the stomach; he had artificial upper teeth, but he never took them out at night, and at most cleaned them every three days. On the palate plate there was a dirty white layer, containing numerous fungus fibres and masses of micrococci, whilst the hard palate was very red and covered with small aphthous spots. In the mucous stomach contents were small brown streaks consisting of granular blood-colouring matter and numberless fungus fibres and yeast cells. The complaints of this patient were comparatively slight, and dated from his first acquaintance with the dentist. Doubtless the swallowing of fungous elements constituted a permanent source of irritation to the gastric mucous membrane.

How necessary it is to take time in eating has been stated hundreds of times. A striking example of this is the circumstance that elderly people with feeble stomachs bear well, when travelling, the hotel food, which is bad or badly prepared, with reference to diseases of the stomach, because they have nothing to do and stop a long time at the table, while they suffer from the carefully cooked and well-chosen food at home, because they eat it hastily and with their heads full of their daily cares. It is also from such psychical causes that a dyspeptic may bear splendidly at times many kinds of food which at other times cause pain, just according to the bodily or mental condition present. Many persons have a complete idiosyncrasy with respect to certain kinds of food, and for others a quite capricious, and, so to speak, unjust tolerance. You will often meet, in your practice, with persons who can bear quite well heavy mayonnaise, pastry, meat of strong fibre, or very fatty, such as lobster or goose, but who get the most severe dyspeptic pain after a cup of milk or gruel. Therefore every experienced physician who has much to do with digestive disorders will sooner or later stop writing special dietaries, and be guided by the experience of his patients. Not altogether untruly does Germain Sée remark, "En France on peut bien soumettre un menu au malade, en Allemagne on l'y soumet!" We can only state the principles of the dietary in general terms, first as to its composition, and secondly as to the quantity. Of course, under certain circumstances, as in the present instance, where the digestion of albumen is interfered with, the albuminous food, whether in the shape of eggs or of meat, must be as far as possible reduced in amount, and what is taken must be in a form which is as accessible as possible to the gastric juice. Moreover, we should be cautious of hard-boiled eggs and meat with tough fibre or much sinewy parts, also of the meat of old animals, and of meat cooked too quickly after slaughtering, before the *post-mortem* formation of acids has softened it. All twice cooked meat is on this account to be forbidden, as well as all meat containing much fat or suet; for example, pork, the fat portions of mutton, fat poultry, oily fish and marine creatures (salmon, carp, marena, eel, lobster, crab, oysters*), sausage, and smoked fish, such as flounders, bloaters, sprats, smoked eel, lampreys, &c. Gigglberger,† under the direction of Penzoldt, has tested, by means of the stomach tube, a great number of various kinds of meat cooked in different ways, respecting their digestibility in the living stomach, and has arrived at the same results as Beaumont.‡ According to these conclusions, the duration of meat in the stomach varies from 2 hours 25 minutes (boiled calves' brains) to 5 hours 25 minutes (roast mutton), and generally roast meat takes longer than boiled meat. Fatty cheeses, too, are very hard to digest; as the proverb says of them, they are gold in the morning but lead at night. I regard bouillon as worth nothing—nothing so far as the albumen it contains is concerned, while the large amount of salts contained in it has an irritating action on the mucous membrane. To this class of irritating ingesta belong also strong acids, such as vinegar, pungent spices, and alcohol in the concentrated form of spirits; while indirectly, that is, by the products of their decomposition, fats and oils irritate, and oily sauces should be excluded from the table of the dyspeptic. Meat diet may be replaced by peptone preparations and peptone-chocolate; for the latter, especially in place of the dear commercial article, a substitute can be cheaply made at home by using cocoa deprived of its fat, or chocolate, and adding to it peptone or meat peptone.

On the other side of the scale of nutriment are the products containing carbo-hydrates, whether pure starch preparations, or partly nitrogenous flours, vegetables, fruit, and leguminosæ, the digestion of which under these circumstances must take place easily, provided that they are well cooked, that is, so treated that the greater part of the starch is converted into dextrine, and the sticky viscous consistence, which is assumed by flour and starch when stirred with water, has been removed by heat and drying in the air. Therefore all new baker's stuff should be avoided; but, on the other hand, the various kinds of flour, with the various gruels and foods and jellies prepared from them, are well borne, as well as vegetables and fruits when they are deprived of their cellulose envelopes, and made as soft as possible or pultaceous, and especially when they are cooked with very little fat. All vegetables of the cabbage kind should be avoided because they have a special tendency to putrefactive decomposition. This is also the case with leguminous vegetables, so that soups of peas and lentils are not well borne. On the other hand, the leguminous flours, of which there are many in the market, constitute a good form of food, but one of which the patient in time gets to tire. But it must be remembered that hydro-carbonaceous food, because it is easily converted into sugar, also easily passes into the products of decomposition, and, above all, that it is only to be used with caution, especially when an atonic condition of the stomach is present.

---

* H. Chittenden, On the Relative Digestibility of Fish Flesh in Gastric Juice. Amer. Journ. vi. No. 5. He ruthlessly destroys the legend of the digestibility of oysters, and places them quite at the bottom of his table.

† X. Gigglberger. Ueber die Dauer der Magenverdauung von Fleischspeisen. Inaug.-Diss. Erlangen, 1866.

‡ See Part I., p. 100.

Midway between the above-named articles of diet stands milk, which should theoretically be the best kind of food. But in practice it is rejected by many persons however we may give it, boiled or unboiled, with soda or lime water or rum, sweet or sour, or in a fermentated state as "Kefir," and by others it can be taken for only a short time. On the other hand we must bear in mind that pure milk diet is equal to a slow hunger-cure, and that if anyone had to live on milk alone he would have to take larger quantities than the human stomach can accommodate. Still, by means of milk powder, *i.e.*, dried and powdered milk, of which 100 grms. are equal to a litre of milk, it is possible to take a large amount.

Finally, dyspeptics must follow the general rule never to eat to satiety, but to stop when the first sensation of satisfaction sets in, and to make sufficiently long pauses between meals.

Respecting drinks, one must always remember the old advice, neither too hot nor too cold, not to take too large quantities, which unnecessarily dilute the gastric juice, and to exclude all those which contain much free carbonic acid gas, or easily undergo further fermentation, by which the stomach is distended and the blood is loaded with carbonic acid, the ill effects of which are very seldom compensated for by its stimulating action. Mild drinks, such as barley water, rice water, infusions of hops, &c., have been long used.

That care in matters of diet must be associated with attention to the general hygienic surroundings need scarcely in the present day be mentioned.

The care of the skin and the lungs, that is, the provision of good pure air, constitutes the alpha and omega, not only of all prophylaxis, but also of the treatment of nearly all chronic diseases. This rule is much transgressed in chronic catarrh, the patients generally thinking that they have done quite enough by their dietetic concessions, and they think nothing of remaining evening after evening in an atmosphere of heated gas, in overfilled drawing-rooms, or in rooms full of tobacco smoke.

Effective exercise, good walks, rides, baths, at times douches, and gymnastic exercises, especially such as bring the abdominal muscles into play, should always form part of the programme of a dyspeptic; and as the majority of men will only carry them out for a short time unless they have some external stimulus, they must be induced to do so in the name of sport, or in the shape of massage. Rowing is especially to be recommended if there is opportunity for it, because modern rowing with sliding seats, as Mitan* has shown anatomically, brings into play all the muscles of the body. Women must in this direction be far behind men, still they can do much by chamber gymnastics, massage, daily walks, and rides. Celsus says, "maximeque qua superiores partes moveat, quod genus in omnibus stomachi vitiis aptissimum est"; but it appears to us more correct to bring the whole body into moderate, not excessive action.

Finally, there are still some special points in the treatment to be mentioned. The treatment of putrefactive and decomposition processes in the stomach is best effected by means of washing out that organ; regular washing prevents the stagnation of ingesta, and deprives the exciters of putrefaction of their material substratum. Where this is not possible we must employ antifermentative remedies, but I will premise that these are useless without at the same time regulating the diet, because it is not possible to introduce them in sufficient quantities to influence large collections of ingesta. Hence these remedies are useless in dilatation of the stomach with much putrefying stomach contents—otherwise we may expect more good from creosote and thymol in doses up to 0·3 or 0·5 in pill or emulsion, or in solution in some viscid vehicle, than of any other remedies of this group; while the action of salicylic acid, benzoic acid, carbolic acid, resorcin, naphthalin, and others, all of which I have employed, seems to me to be doubtful. I have no personal experience of the sulphide of carbon water recommended by Dujardin-Beaumetz,* but the use of chloral in cases of mild putrefactive processes combined with gastralgia is very favourable, because it unites a sedative action with its power as an antifermentative. The three cases of agarophobia related above were cured by chloral. I give it in a 3 to 5 per cent. solution, a tablespoonful to be taken every two hours.

---

* Mitan. Das Rudern, eine heilgymnastische Uebung. Inaug.-Diss. Berlin, 1882.

I may also mention here the antifermentative action of continued treatment with hydrochloric acid. You know, gentlemen, that the pains caused by putrefactive acids may be momentarily relieved by alkalies, and that recourse is often had to small quantities of soda with rhubarb or bismuth after meals, but you know also that this is only treating a symptom, and that it leaves the original cause untouched.

With the proper use of antifermentative means the formation of gas disappears, and it is not necessary to make use of the more than questionable means recommended for the absorption of gases. It is, for example, quite irrational to use charcoal which has recently been introduced commercially in the form of biscuits made of wood charcoal. The charcoal becomes wet in the stomach, and wet charcoal loses completely its capacity to absorb gases.

Gastralgia may be allayed, in so far as this is not effected by general measures, by the various opiates, temporarily best by morphine injections. Extract of henbane, hydrocyanic acid, belladonna, and washing out the stomach with chloroform water (1 to 200) are recommended with this object. I have seen good results from a combination of cocaine, morphine, and the two last named remedies in the following form: ℞. morphinæ mur.

---

* Dujardin-Beaumetz. Les nouvelles médications. Paris, 1886, p. 76.

0·02—0·2, cocainæ mur. 0·3, tinct. belladonnæ 5·0, aq. amygdal. amar. 20·0. Budd attributed a sedative influence in gastralgia to Fowler's solution taken half an hour before meals, while Siebert* has come to the conclusion that under the use of arsenic the pains of nervous or catarrhal gastralgia disappear after a few days, but that those of ulcer persist.

Purgatives.—Irregularity of the bowels plays an important part in all forms of gastritis. I have at the commencement of these remarks referred to the mutual relation between the stomach and intestine, and I have repeatedly remarked that many so-called stomach troubles have their proper seat in the intestine. Although I reserve the description of these conditions for full discussion under diseases of the intestines, we cannot evade the question of the use of purgatives, for they act not only on the disorders and affections of the bowel but also directly on the stomach, as the emptying of the latter into the bowel is facilitated by the prompt expulsion of the intestinal contents. Those remedies which excite the flow of bile, and at the same time increase peristalsis, are purgatives. In the great majority of cases of chronic catarrh we have constipation to overcome, not diarrhœa to soothe.

A group of purgative remedies may be at once eliminated. these are the vegetable oils, whose chief representative is castor oil. It irritates the stomach, and is besides, even when given in emulsion, very nauseating to the patient. If in spite of this it has been used in numerous cases of so-called gastric catarrh, it is because the catarrh in these cases was more in the intestine than in the stomach, and the ill effect upon the latter organ was more than compensated by the favourable effect upon the bowel. But I have been able to prove experimentally the disturbing influence of the oil on the chemistry of digestion.† Moreover, we should only make use of saline aperients when we wish to produce an action upon the small intestine. In that case Glauber's salts water, or as this is generally not sufficient, the sulphates in substance should be employed. A good remedy is sulphate o soda in combination with rhubarb and carbonate of soda, th old *solamen hypochondriacum* of Kleist, which has been recently recommended by Leube. ℞. pulv. rad. rhei 20·0, sodii sulphat. 10·0, sodii carb., sodii bicarb. ana 5·0. This may be varied according to individual requirements by adding magn. usta or acid. tartaric. or potass. sulph., or as I willingly do, by combining with it salicylate of bismuth and ext. nucis vomicæ (in atony of the stomach and tendency to flatulence from intestinal decomposition). We may also mention cream of tartar, bitartrate and tartrate of soda, which are employed in lemonade, in powder with precipitated sulphur, and in decoction with the vegetable substances about to be named.

---

* Siebert. Ueber Magenschmerz und Magengeschwür. Deutsche Klinik No. 10, 1852.

† Ewald and Boas. Zur Physiologie und Pathologie der Verdauung, irchow's Archiv. Bd. 104.

Vegetable aperients.—The mildest of these are all kinds of fruits which act by virtue of the vegetable acids they contain. It is a well-known custom to take baked prunes at night before going to bed; less well known is an electuary made of two parts of prunes and one part of dried figs, which unites a pleasant taste with a gentle action on the bowels. Of aperients proper, the chief is rhubarb, which in various shapes forms a priceless vade mecum to all dyspeptics. Next to it stand tamarinds, then the bitter purgatives, senna, frangula bark, centaury, taraxacum, coriander seeds, fennel, and many others, some taken in the form of extract, some in infusion, of which the best known is the so-called Hamburg tea. Of senna it may be remarked that it sometimes causes nausea and severe colic, but these bad effects are prevented by extracting it with alcohol (fol. senn. spir. ext.), or adding to it some aromatic spirits of ammonia or tincture of cardamoms. The tincture of cascara sagrada, so much employed recently in doses of fifty to eighty drops at bed-time, is a mild and generally effective aperient, but its action, like that of others in this group, diminishes with time. The extract of calabar bean (0·05 to 10 glycerine) recommended by some has appeared to me very uncertain in its action.

Aloes acts especially on the large intestine, taken either alone or with jalap, or scammony or colocynth. It is regarded by English authors as a stomachic, and is specially given in combination with calomel, the purgative and cholagogue actions of which are well known. As podophyllin, according to the investigations of Rutherford, is also a cholagogue, and has the advantage over calomel of having no other action, I am in the habit of combining it instead of the latter with aloes, &c.

Finally, there are enemata of hot water, of water with salt, soap, senna, castor oil, and such like. It is an old dictum of experience, upon which Trousseau laid stress, that "lavements" should not be given immediately after a meal. That no hard nozzle of horn or vulcanite should be pushed into the rectum, but a soft thick india-rubber tube with one terminal and several lateral openings, and that the enema should be injected very slowly, have in recent years especially been emphasised. The chief result and value of injections is in cases where there is want of tone in the colon. They soften hard masses of fæces which collect in the descending colon and sigmoid flexure, and they exert a slight stimulus on the muscular wall of the rectum. On the latter rests the efficacy of the lately recommended injections of small quantities of glycerine which forms the active constituent of the so-called Oydtmann's purgative, and the much-in-request glycerine suppositories which are made of glycerine and some easily melted material. So long as enemata act, that is, so long as there is only torpidity of the rectum, they are certainly the best and least injurious form of artificial aperient, and the alleged harmful effect of causing catarrhal irritation of the bowel after prolonged use happens very seldom. I know persons who have used them daily for years, but in the majority of cases after a certain time they cease to act.

In conclusion, I must not forget to mention that a number of cases of chronic catarrh of the stomach cannot be cured by stomachic remedies, but require the causal condition to be treated. These are principally those cases of catarrh recurring in lung, heart, and kidney diseases, and in the course of chlorosis; but, as the stomach symptoms are frequently the most prominent, such cases are not very infrequently treated for these for a long time, until a more careful examination clears up the nature of the case, and appropriate treatment removes the stomach trouble.

Gentlemen, a very important place in the treatment of chronic gastritis is taken by the use of thermal springs, either *in loco* or at home. The latter is only a make-shift, as there are wanting the powerful adjuvants of a watering-place, the mental and bodily rest and refreshment, the *dolce far niente* of the life at a Spa, the regular life and the dietetic conditions, even if we do not doubt that the cure can be carried out otherwise as well at home, if people have time and rest to indulge in them.

But transported mineral water, in spite of all the improvements in bottling and transit, cannot have the quickening freshness or the strength of the foaming spring.

For the local treatment of stomach diseases the following kinds of thermal waters are chiefly employed:—

1. Pure salt water.
2. Salt water strongly impregnated with carbonic acid gas.
3. Alkaline saline springs, in which the amount of common salt and carbonic acid is greatly exceeded by that of neutral salts.
4. Alkaline and alkaline muriatic water.*

Unfortunately, we must admit that we know only very little respecting the action of these springs on the stomach, the information that we possess respecting them pointing rather to their direct influence being on the intestine and only indirectly on the stomach. We find ourselves all the more in the dark as the experimental investigations of Pfeiffer † and Jaworski have shattered our belief in the influence of Glauber salts water in diseases of the stomach. Jaworski ‡ has come to the conclusion from his investigations that Carlsbad water only at first, and taken in small quantities, stimulates the gastric secretion, but by longer use diminishes it; indeed, finally it causes it to stop altogether, and may lead to atrophy of the glandular apparatus. I have induced Dr. Sandberg, of Marstrand, to test these startling statements. According to him, of ten persons after four or five weeks treatment, in whom continuous examinations were made, half showed slight

---

* The following comparison may serve as an illustration :—

Wiesbaden Kochbrunnen.		Kissingen (Rakoczy).	
Sodium chloride	6·83	Sodium chloride	5·82
Calcium chloride	0·47	Potassium chloride	0·28
Calcium carbonate	0·42	Calcium carbonate	1·06
Carbonic acid	0·5 cc. per litre	Carbonic acid	1392 cc. per litre
Carlsbad Mühlbrunnen.		Ems (Kesselbrunnen).	
Sodium sulphate	2·39	Sodium carbonate	1·99
Sodium carbonate	1·27	Calcium carbonate	0·22
Sodium chloride	1·02	Sodium chloride	1·0
Carbonic acid	1·27 cc. per litre	Carbonic acid	553·2 cc. per litre

† E. Pfeiffer. Balneologische Studien über Wiesbaden. Wiesbaden, 1883. Article, "Kochsalz oder Glaubersalz?"

‡ W. Jaworski. Ueber die Wirkung des Carlsbader Wassers auf die Magendarmfunction. Deutsches Arch. f. klin. Med. Bd. xxvii.

diminution and half slightly increased acidity. The diminution occurred in persons who before the commencement of treatment had shown a high degree of acidity. But the amount of acidity, as previous testing showed, in one and the same person varied very much, so that we must not attach too great weight to these results, as at the same time no important alteration in the peptic activity and milk-curdling action was found. Without doubt these investigations have resulted in correcting Jaworski's statements, so far that the Carlsbad water does not possess the perfidious property of destroying the chemical action of the confiding stomach in the short period of four to six weeks, over which the cure usually extends. At least, not in Berlin. For we can only speak of the water sent to a distance, and must leave it to the Carlsbad doctors, should they think it necessary, to rehabilitate the reputation of the nymphs of their fountain in their own home.

For the influence of chloride of sodium water on the stomach digestion, I must refer you to what I have said on p. 541, and only add that Boas* has methodically studied the changes in the secretion of the gastric juice under the influence of warm chloride of sodium mineral water, and has ascertained that after its use for three or four weeks there was a decided improvement in the secretion of the glands and a corresponding diminution of pain. The action of chloride of sodium water rests chiefly on the increase of secretion, and of absorption and of tissue change, which, indeed, occur also in the use of alkaline saline waters, but with the former to a far greater extent than with the Glauber salts waters. The latter and the alkaline springs have, by virtue of their high degree of alkalinity, an acid neutralising action. All possess the power of dissolving mucus. The sodium chloride waters stimulate the action of the stomach, while the sodium sulphate waters act chiefly on the liver and intestine. All possess the simple mechanical power of washing out the stomach. But while we may say of the sodium chloride and alkaline waters that they can scarcely injure the organism generally, or, as the laity say, they are "not weakening," this is often true in a high degree of the sodium sulphate springs, and in anæmic and nervous persons it shows itself by increasing their irritability and depression.* Therefore patients with unmistakable neuroses of the stomach should not take the latter waters; indeed, they should not take any stomach waters at all. They should be recommended an invigorating regimen, which must vary according to each case, sometimes requiring mountain air or the sea, sometimes the use of mud or brine baths, with moderate doses of alkaline muriatic water. This includes the great group of nervous dyspetics, the people with atony of the muscular wall of the stomach of nervous origin. According to my experience there are a good many mistakes of this kind made, as I hear every year scores of patients complain that they have been sent to Carlsbad, but that the treatment has only made them worse. Carlsbad and Marienbad are frequently the most dangerous enemies of these patients; Tarasp, on account of its altitude, holds a middle position; Kissingen, Wiesbaden, Homburg, Nauheim, Franzensbad, &c., or the sodium carbonate springs like Vichy, Ems, Neuenahr, Bilin, and others, are more indifferent, and may by altering the mode of life, and by the other known means which co-operate for the success of the treatment at a watering place, prove beneficial. On the other hand, the alkaline saline and the alkaline springs, as I shall mention in reference to the treatment of stomach neuroses, act magnificently in hyperacidity and hypersecretion, and conditions connected with them, as has been long recognised by experience. The results which are met with in gastric ulcer at Carlsbad are easily explained, as we know that ulcer is often connected with hypersecretion, and that the thermal water not only momentarily neutralises the excess of acid, but can also diminish the activity of secretion. A similar action may be expected from the pure alkaline springs, though they are not, it must be confessed, made much use of knowingly for this purpose.

---

* J. Boas in Verhandl. d. Ver. f. innere Med. zu Berlin, 5 Nov., 1888.

Finally, those forms of chronic gastric catarrh are to be treated with sodium sulphate waters where the disease in the stomach is only secondary and the chief irregularity is in the functions of the liver and intestine.

On the other hand, all forms of catarrh attended with depression of the gland function, with or without secretion of mucus, should be treated at the sodium chloride springs. Simple salt water should be used when we only wish to increase the still active secretion of the stomach and bowel, but the carbonated waters when it is desired to get a stimulating effect, and by slight purging as well as by the use of brine to raise the amount of tissue change. All waters when used for affections of the stomach are better taken hot than cold.

---

* Further, I find that such an experienced practitioner as Cordes (l.c. p. 535) expresses himself as follows:—"I take this opportunity of warning in the strongest terms against patients with nervous debility being sent to the sodium sulphate hot springs, which always do harm, as the irritation they cause in the bowel and stomach is in this condition simply injurious."

Finally, I have only given you here a few landmarks for the employment of mineral waters; for further details I must refer you to the text-books on "Balneology," and to the splendid account by Lichtenstern, in Ziemssen's "Handbook of General Therapeutics." I need not say that there is still plenty of room for individualisation, and that at the various places different arrangements, such as brine and chalybeate baths, slight courses of chalybeate water, massage, and electricity, may be selected with care, and the treatment conducted not after one uniform pattern, but according to individual requirements. We shall doubtless treat our cases with more precision and have better results if we diagnose gastric catarrh according to the rules already given. This is only possible by the help of the chemical method, the employment and consequences of which are of great importance here, where they were least expected. But whoever advises a patient on the choice of a health resort—and this always is a very important question for doctor and patient—should, as far as possible, know the places in question from personal knowledge. It is also important to individualise, as the same places do not suit all alike, even when the chemical analysis of two similar springs coincides to three or four decimal points. There are so many adjuvants in a health resort, not the least being the personality of the colleagues to whom we entrust our patients, that we should be grateful to all watering-place physicians when they give themselves the trouble to make themselves personally known to us.

LECTURE IX.

THE NEUROSES OF THE STOMACH.

Gentlemen,—By neuroses of the stomach, we mean those conditions in which painful digestion occurs without any demonstrable anatomical organic disease, or only such changes as are secondary, that is to say, those disorders which we describe as *functional* in contradistinction to those called *organic*. The knowledge of these conditions is by no means of recent date. For example, you will find a description by Comparetti, which is magnificent for the time at which it was written, towards the end of the last century,[*] and since then many authors, especially French and English, of whom I will name only Barras, Beau, Trousseau, Chambers, Budd, Fothergill, Fenwick, and Clifford Allbutt, have worked at the subject of gastric neuroses. Yet it is not to be denied that we have made great progress recently in our knowledge of this group of symptoms by the united labours of an international band of workers, and we in Germany especially by the work of Leube. But we must regard it as unfortunate that our knowledge of this subject is still too much of a merely descriptive nature, and that it is not yet possible to penetrate into the causes of things. Certainly, if we reflect that the stomach is the centre of a wide branching nerve plexus, the cerebral and sympathetic fibres of which anastomose in numerous places, so that they transmit crossing and confusing impulses, which may act by stimulating as well as controlling, we can understand how difficult it is to bring order into this chaos, and the almost inextricable tangle of its fibres that has to be analysed. But it is also intelligible that some authors, among whom Stiller, Rosenthal, and Oser,[†] may be specially named, meet with difficulty in giving an adequate basis to our physiological knowledge of the manifold phenomena of disordered nerve functions in the stomach. Indeed, the latter is even at present so slender and incomplete, that conjecture and hypothesis occupy a large space, whilst the actual material out of which our pathology is built occupies an area which is relatively easily explored. It is, therefore, not very difficult to give the rein to varied speculations, and to jump to conclusions about centres of innervation, such as, for example, Rosenthal's hunger centre, the existence of which has yet to be proved, and for which it is easy to find arguments *pro et contra*. I shall refrain from such deductions, but I believe, gentlemen, that this affords a good opportunity for some reflections of this kind, and therefore I shall proceed to tell you what we know of the innervation of the stomach and its connection with the general nervous system before discussing the pathology of its neuroses.

---

[*] Occursus medici de vaga ægritudine infirmitas nervorum. Andreæ Comparetti, Venetiis, 1790.

[†] Stiller. Die nervösen Magenkrankheiten. Stuttgart, 1884.—Rosenthal. Magenneurosen und Magenkatarrh. Wien, 1886.—Oser. Die Neurosen des Magens und ihre Behandlung. Wiener Klinik, 1885.

My brother, Dr. R. Ewald, Extraordinary Professor of Physiology in Strasburg, has at my request written the following account, for which we owe him many thanks:—

THE INNERVATION OF THE STOMACH.

It was an enormous stride in advance, when the old theories of vital action were dethroned, and men decided to look to physical causes only for the explanation of the processes taking place in the organism. Physical methods were adapted to the investigation, and vital processes were referred to physical laws. It was by the examination and observation of these processes that physiology first rose to be an independent science, after having been for so long apparently treated in a very step-motherly fashion as only a branch of anatomy. But the daring hopes which a few decades ago were built on the sufficiency of simple physical explanations, have since in many instances proved to be unsound, and after having long in vain expected from physics the solution of every problem, a reaction has set in. Indeed a part of those very investigators who originally held highest the banner of physical explanations, has ceased unconditionally to follow those alluring paths. Not that they are returning to the old doctrine of vital action, not that they are giving up in discouragement the search for any explanation, but that they are convinced that physical laws do not suffice to explain the obscure problems of life in many, indeed in nearly all known instances. Unfortunately we are forced to accept in this place a specific, and to us quite unknown action of living cells. This reaction, which has succeeded to the dogma of physical explanation, is a healthy movement, it exposes our ignorance and brings us nearer to the knowledge of nature, for if after all our striving we only get a mechanical idea of things, we are still hopelessly distant from the goal of all science. We can reach this only by further advances in our knowledge of the life processes of individual cells; that is the progress which is contained in this reaction against purely physical views. The same ideas which have raised physiology to a special science would have merged it in physics and chemistry, but now its independent existence is for ever assured.

General relations between the functions of the stomach and the nervous system.—The functions of the stomach consist chiefly in secretion, absorption, and movement. The hope has been entertained that the action of the glands might be explained by filtration and diffusion, viz., by purely physical processes. The chemical and physical changes in the blood-stream surrounding the glands, of which the physical part is regulated by the nerves, seemed sufficient to explain the variations in the intensity and composition of the secretion.

Johannes Müller long ago suggested the specific action of gland cells, and recently it has been clearly proved that the physical processes of filtration and diffusion do not suffice to explain secretion, and that we are obliged to assume a peculiar cell action.* The nerves can regulate the activity of these cells, but unquestionably secretion is possible without any nervous influence, and in this respect the animal organism does not differ from that of plants which possess glands but no nerves.

Still more obvious is the specific action of the cells in the process of absorption. Here, in violation of physical laws, certain substances are taken and others left. It has been observed that lymph cells wander on to the surface of the intestine and absorb fat droplets. They then crawl back into the chyle vessels and yield up their fat. How is it possible, in the face of such facts, which appear to play an important part in absorption, to think of physical explanations? At any rate there are special functions of the living cells at work in absorption besides filtration and diffusion.

---

* Vide part I. p. 32 and p. 59 et seq.

The conditions of motility are not more favourable. I put aside the fact that the process of muscular contraction is as unintelligible to us as the transmission of nerve force. But the dependence of contraction on nerve impulse, and the invariability of the results of this impulse, namely, the occurrence of muscular shortening, appear to follow physical laws. In striped muscle it is difficult to find any exception to this rule, if we except the abnormal case of direct stimulation of muscular fibres. Striped muscle always remains at rest until a nerve impulse is sent to it, and this impulse can only cause shortening, whether it is a twitching or a tetanic contraction. The exception apparently afforded by the heart, which continues to beat when all its nerves are divided, is sought to be explained by the impulse originating in the heart itself, and being conveyed to the muscle by the intracardial nerves. However, it has been found that portions of the heart which certainly contain no ganglion cells continue to beat rhythmically, and still greater difficulties in the way of maintaining the above-mentioned law of the dependence of muscular contraction on nerve impulse are afforded by observations on unstriped muscle. It is not only that we have, as, for example, in the ureter, movements not directly influenced by nerves, but it is not possible to perceive any shortening of the muscle as a result of nerve stimulation. The vaso-dilators of the small arteries relax on stimulation, and as the longitudinal muscles do not for many reasons suffice to explain this, we are driven to the paradoxical conclusion that the circular muscles lengthen on stimulation. We must admit in principle that the law in question, with perhaps the exception of the striped muscles, has no general validity, and that muscles can make independent movements and even lengthen on stimulation.

After these remarks it is perhaps easier to appreciate the uncomfortable fact, that we know very little with certainty respecting the secretion, absorption, and motility of the stomach. Experiments frequently contradict each other. Many contain conditions which on careful consideration exclude a definite answer. It has been the case that too many physical considerations have been allowed to enter into the investigation of this organ, where, as throughout the digestive tract, biological laws are of more importance. It appears to be altogether an organ which depends on the independent activity of its cells, and which has the less need of a nervous system for its functions, as these are chiefly of a vegetative kind. In fact, if it were possible without injury to the other tissues to remove all nerve elements, ganglia, and fibres from the walls of the stomach, it would certainly continue quite indifferently to secrete, absorb, and move. It may be asked, what is the object of the numerous nerve fibres which pass into the stomach? For the same purpose as nerve fibres are supplied to the independently beating heart: to bring these organs into relation with the rest of the body. The stomach has nervous connections with the central nervous system, by which it can answer to the needs of the rest of the body, and on the other hand the entire organism has to take into account the state of the stomach.

Anatomy.—The vagus. Below the neck both vagi nerves accompany the œsophagus, the smaller left nerve lying in front and the larger right nerve behind. They pass in this way through the foramen œsophageum. But these are not the only vagus fibres which reach the stomach. So soon as the vagus reaches the œsophagus it gives off numerous small branches, which form a dense plexus, and find their way to the stomach in the substance of the œsophagus, out of sight to the experimenter. It therefore is not sufficient to cut through both vagi trunks on the œsophagus in order to make the stomach independent of these nerves (Brachet), as we can only be certain of having divided all the vagus fibres when a circular incision has been made around the œsophagus, below the diaphragm, penetrating to the muscular coat (Schiff). The left vagus is distributed from the anterior aspect of the œsophagus to the cardia and smaller curvature, where it forms the *plexus gastricus anterior*, and breaks up in terminal twigs, which course along the anterior surface of the stomach to the pylorus, and engage in many anastomoses with sympathetic fibres. Of the right vagus, two-thirds go to the abdominal organs and only one-third to the posterior surface of the stomach, where it forms the *plexus gastricus posterior*. From this the terminal branches ramify over the posterior surface of the stomach, and, like those of the left vagus, they form numerous anastomoses with the fibres of the sympathetic.

The sympathetic.—From the cœliac plexus, the *cerebrum abdominale* of the ancients, arises a series of secondary plexuses, in the formation of which the vagi nerves, especially the right, participate. To these belong the coronary plexus, accompanying the coronary artery to the small curvature of the stomach, and which is connected with both gastric plexuses of the vagi nerves. Another is the hepatic plexus, which is partially formed by the vagi. With the right coronary artery a branch of this plexus runs to the small curvature and joins the coronary plexus. Another somewhat stronger offshoot of the same plexus receives the special name of the inferior coronary plexus, and runs with the right gastro-epiploic artery to the great curvature. From this plexus there run numerous connecting branches to the gastric plexus of the vagi.

Ganglion cells.—The origin of both of the intestinal plexuses may be traced in the stomach. The myenteric plexus begins in the small curvature and develops into a thick ganglionic plexus in front of the pylorus, where it forms connections with many gastric branches of the vagus (Auerbach). The submucous plexus (Meissner) is also demonstrable in the pyloric part of the stomach. Presumably, here as elsewhere in the intestine, it consists of wider meshes and fewer ganglion cells than the plexus myentericus.

Secretion.—Though the nerves connected with the stomach have been repeatedly stimulated or divided, no one has yet been lucky enough to influence definitely the secretion. We might, indeed, call in question the secreting function of these nerves if we did not know by other experiments that stimulating and controlling impulses reach the gastric glands through these channels. Among the most important in this respect is an observation of Richet's. It was on a man who had a gastric fistula made on account of contraction of the œsophagus. The proof that the œsophagus was completely occluded, and that no saliva could penetrate into the stomach, was obtained in the following fashion: the man was allowed to masticate ferricyanide of potassium, and it was ascertained that no trace of this salt reached the stomach. But a copious secretion of gastric juice occurred every time strong tasting substances (sugar, lemon-eel, &c.) were given him to chew, and this interesting case howed that the gastric secretion may be stimulated reflexly hrough centres outside the stomach, and that the glands are nervated through fibres going to the stomach. Like the erves of taste, the nerves of smell also may produce this eflex secretion directly, that is, without any intervention of psychical process. It is otherwise when the optic nerve is oncerned. Gastric juice is secreted abundantly when hungry ogs only see the meat, just as prolonged looking at a piece f sugar makes saliva run out of the mouth. In these cases, owever, the reflex does not take place directly through the ptic nerves, but the sight of food awakens a mental perception, nd this causes the secretion. Do we not know in our own xperience that it is not necessary to see food, but that it uffices to think of a good dinner to make one's "mouth water"? nd we shall not be far wrong if we assume that this reflex xtends to the glands of the stomach.

Just as the gastric secretion may in this way be stimulated, o may it also be checked. The taste of disagreeable food, s well as its smell, aspect, or even the idea of it can at times ffect this. These reflexes, either of a controlling, or, in the ase of acceptable food, of a stimulating kind, may unite and roduce an increased effect.

It follows from the action of visual perceptions on the gastric ecretion that psychical processes influence the secretion of astric juice, so that this combination becomes most important hen special affections are concerned. They appear to unite o check secretion, and mental fright may have a specially nergetic action. It dominates the entire intestinal tract. n fright the food sticks in the throat because the secretion f saliva stops, and the mechanism of swallowing refuses to ct; in fright defæcation occurs, because intestinal peristalsis s increased.* And when we hear in numerous cases that in right the food remains long undigested in the stomach, perhaps o be ultimately vomited, we shall not go far wrong if we ttribute this to failure of the necessary gastric juice corresponding to the absence of saliva, for increased peristalsis, such as we observe in the bowel, could only favour digestion in the stomach.

---

* It has been incorrectly assumed that defæcation occurs because the phincter opens. The rectum is normally empty, and the opening of the phincter cannot under these circumstances cause defæcation. Besides, this annot explain the occurrence of diarrhœa from fright.

Undoubtedly sometimes stimulating, sometimes controlling, impulses pass through the nerves entering the stomach to its glands, but the fact remains that after section of all these nerves secretion does not cease, and may be increased by irritating the mucous membrane. It is not impossible that the irritation may act directly or through sensory channels on the ganglion cells in the wall of the stomach, and that from these the glands may be excited to action. But this is in no way proved, and as Heidenhain expressly remarks, the idea should not be completely lost sight of, that the stimulus may act directly on the gland cells without any nervous intervention. Normally, as has been shown in cases of fistula, the contact of a body with the mucous membrane stimulates secretion in the circumscribed portion where contact is made. In that case there is only a mechanical stimulus, as the same results are attained by the introduction of stones or tickling with a feather. The secretion which occurs is, however, only very slight, but it becomes more intense and loses its circumscribed character if absorption, even of non-nutritious fluid, such as water, occurs at the same time. But the glandular activity first becomes generalised and of normal vigour when the stomach contains nutritive fluids which become absorbed. It is not necessary that these fluids should have entered the stomach as such, but it suffices that quantities of fluid are present, formed by the solution and digestion of solid nutriment after its introduction. Whether the absorbed nutriment acts by altering the blood, or directly by influencing the nervous elements of the stomach, must remain undecided, but the reflex character of the extension of the stimulus over the whole stomach is pronounced, and we may believe that in normal digestion the contact of food sets up a local secretion, which is, perhaps, caused by direct stimulation of the glands, and that at the same time absorption of nutriment develops a general glandular action, which takes place reflexly.

Absorption.—A not unimportant part of the fluid or liquefied food becomes demonstrably absorbed in the stomach. As the vascular walls and the surrounding parts of the stomach constitute an animal membrane, filtration and diffusion may play a great part, and this explanation of absorption appears all the more acceptable as changes, which are observed in absorption and which must be attributed to nervous influence, are easily referred to vaso-motor variations in the width of the blood-vessels and sometimes of the lymph channels. But absorption also is directly under the influence of the nerves. The first actually decisive experiment on this subject we owe to Goltz. It is shortly as follows: the hearts of two frogs are excised, the thoracic circulation being thereby completely put an end to. In one frog the brain and spinal cord are destroyed, in the other they are left intact. In each frog an injection of strychnine is made under the skin of the calf, of equal strength and equal quantity; after a certain time the forearm of the frog with the uninjured spinal cord contains strychnine, and a new frog may be poisoned by it, while in the frog with its spinal cord destroyed the forearm contains no strychnine, and has no poisonous action on another frog when introduced into its body. As in this experiment circulation of neither blood nor lymph could take place, the strychnine must have reached the arm from the calf by diffusion, or, in order not to employ purely physical terms, by absorption; it is, therefore, proved that the rapidity of this transference is under nervous influence.

What is the nature of this influence? Certainly it is not purely physical, as if the nerves produced a change in the texture of the part concerned, in consequence of which the rapidity of diffusion was different, just as a tightly-stretched membrane behaves differently to filtration and diffusion than a relaxed one. We should rather assume that the action of certain living cells is altered by the nerves, so that these take up the strychnine solution with great rapidity, and give it up again to the adjacent cells. That we have to do with an independent function of living cells may not seem so strange if we recall the above-described action of the white blood corpuscles, or the observations that certain cellular organisms select particular algæ for their food.

Absorption in the stomach may very well take place without any nervous influence by a special action of the cells of the mucous membrane, of the vascular walls, and finally of the blood itself. It may be altered quantitatively and qualitatively by nervous influence. It is, moreover, probable that the process is at least partially regulated by the physical laws of filtration and diffusion, which on their side depend on the chemical and physical changes in the circulation. But the physical conditions of the circulation are directly subordinated to nervous influences, so that there is a two-fold nerve regulation of absorption. Where the channels are situated through which the direct influence of cell activity passes we have no indication. Those which operate through the circulation will be described immediately.

Vaso-motor nerves.—In active secretion by the stomach glands, whether this is circumscribed or generalised over the whole organ, we always find the secreting area at the same time deeply congested. The arteries are dilated, the blood courses rapidly, and arrives in the veins with its bright colour little altered. The object of this rush of blood is obviously to supply sufficient material for secretion. These changes in the circulation are recognisable by the reddening of the mucosa, while at the same time the folds of mucous membrane, especially the large ones in the pyloric region, show increased turgescence and become erect.

How does this vascular dilatation occur? The vascular nerves may be directly stimulated either by the mechanical irritation of the weight of the food or its friction against the stomach wall, or by chemical irritation caused by absorbed material. The size of the dilated vascular area would correspond to the region of distribution of the directly stimulated nerves. But if the mucous membrane is irritated by a feather, or a solid body lies on it for some time, a circumscribed redness occurs, which corresponds to the part of the mucosa which is touched. The first described mode of transfer of stimulus to the vascular nerves becomes very improbable in the light of this observation, and this marked localisation of the redness speaks much more in favour of an immediate action on the vascular wall itself. A similar and decidedly more distinctly localised redness may be produced by rubbing the skin, especially by drawing a streak across it, while chemical irritants are also equally localised (irritating plasters). So far as the skin is concerned we are convinced that we have to do with a direct influence of the vascular wall, and the conditions seem not to be otherwise in the stomach. But it must not be imagined that the vascular reflex does not play a great part, starting from the mechanical, chemical, and thermal irritation of the sensory nerves, and acting on the vaso-motor nerves through the centres in the medulla and spinal cord (Schmidt-Mulheim). We know too that a rise of temperature, the analogue to secretion, occurs in the stomach when we hold bacon before hungry dogs. Probably the conditions here are the same as in secretion. The direct local stimuli associate themselves with the reflex stimuli, and these latter, in distinction to the former, influence the mucosa over its entire extent.

We have every reason to believe that the vaso-motor nerves run in the sympathetic trunks. In favour of this we have not only the analogy of the rest of the body, but also the relatively slight vascular alteration that occurs on section of the vagi. The vaso-constrictor and vaso-dilator nerves run side by side, and this furnishes the answer to the question why, in almost all experiments instituted to clear up the dependence of the stomach action on the nervous system, not only different experimenters but the same observers have repeatedly come to contradictory conclusions. Not only the great size of the nerves supplying the stomach makes us conclude that they possess numerous functions, but we have in the action of fear, in Richet's case, and in other observations of this kind, undoubted proofs of centrifugal impulses. Why does this action so frequently fail to appear when the vagus and sympathetic are stimulated? Why does a definite action occur in some cases, and in others quite the opposite? I do not believe that it is sufficient to explain the differences in the different experiments by the longer or shorter interval of time since the last meal, by the greater or less terror of the animal, or that it depends on differences in the anæsthetic. The explanation is much more probably, it appears to me, to be looked for in the following facts: if we stimulate the vagus in the heart we get an excessive action of the controlling fibres, so that for a long time the existence of stimulating fibres was denied. The action of the stimulating fibres was overwhelmed by that of the controlling fibres, so that the presence of the former was ascertained rather late. If the action of both sets of fibres had been equal, what would have been the result? Either there would have been no result, or at one time stimulation, at another time depression, would have resulted. If all the conditions were equal the experiment would give a negative result. But small variations in the position of the electrode, or in the application of the stimulus, differences in the fatigue of different kinds of fibres, &c., could occasion a positive result. It depends also on the condition of the heart and of the organ on which the nerve action is exercised. To show this I may remind you that when the sciatic nerve of a dog is irritated the vessels of its paw become contracted if dilated by heat, and if contracted by cold become dilated. If we assume that all the nerves supplying the stomach possess an equal controlling and stimulating action, this will explain why it is that during life influencing impulses can pass through the vagus and sympathetic, and yet the function of these nerves has remained a secret to the methods of investigation hitherto employed.

Motility.—As a rule that is not without exception, ganglion cells are found where we observe independent movements of the excised organ, and we are disposed to conclude therefrom that the movements are caused by the ganglion cells. Corresponding to this view, an excised piece of intestine shows lively peristaltic movements, and here we have the ganglion cells of the *plexus submucosus* and the *plexus myentericus*. The excised œsophagus can keep up movements for twenty-six hours, and here too we find numerous ganglion cells in its wall.

Finally, the condition of the stomach is the same, for when it is separated from the rest of the body it exhibits independent peristaltic movements for a long time, and it possesses in its wall the above-mentioned (p. 560) groups of ganglion cells. These movements of the excised organ appear to differ from normal movements by the want of regularity in their course. Peristaltic and antiperistaltic movements succeed each other without any rule, or occur at the same time in different parts of the stomach. Normally there have been observed, both through a fistulous opening and when the stomach has been very carefully exposed, two chief kinds of movement—the movements of the empty stomach and those of the digesting stomach. The empty stomach moves itself more slowly, less frequently, and the individual contractions are less energetic; that is, they are less deep. The digesting stomach, on the other hand, exhibits contractions which take place more quickly, certainly occur more frequently, and are individually stronger.

The most different types of movement have been observed. They generally appear to start from the pylorus as antiperistaltic waves, but only reach as far as the middle of the stomach and then they run back to the pylorus as peristaltic waves. This origin of the movements harmonises with the fact that most of the ganglion cells are present at the pylorus. But the other half of the stomach shows numerous movements, though they are not so easily followed.

Descriptions have been given of a permanent transverse constriction in the middle of the stomach and of the so-called "cravate de Suisse," but we will not go further into these conditions, and shall only refer to two important conditions. In the first place, a distinction must be made between the movements of the ingesta and the external visible movements of the stomach which by no means coincide. The first are such that the food makes a sort of circular course in one direction or the other round the stomach. Secondly, we must emphasise the fact that the stomach at no time exhibits peristalsis running exclusively in one direction, and that we cannot be sure from the outside whether chyme is propelled through the pylorus or not. Long pauses may occur between the movements both in the empty stomach and during digestion, but especially during the former state. The empty stomach can remain at rest for hours, the full stomach for minutes.

If we inquire into the object of these movements, it results from the relatively thin muscular coat that they are only of feeble strength, and therefore cannot effect any mechanical division or trituration of the food. Such a mechanism obviously is inconsistent with the presence of a secreting apparatus, which would be injured by great pressure. We see therefore in birds, which possess such a mechanism for comminuting and grinding food, that this is confined to a special stomach, the muscular stomach, whilst the glandular function proceeds in a second stomach specially appropriated to it. In infants, the movements of the stomach can only have the double purpose—firstly, of stirring the food round so as to bring it equally under the influence of the gastric juice, and of stimulating secretion by mechanical irritation of the stomach wall; and secondly, of expelling the chyme from the stomach.

The beginning and the end of the muscular apparatus of the stomach are formed anatomically and also functionally expressed by the cardia and pylorus. The data respecting the functions of these sphincters are little in harmony, but the following may be regarded as fully ascertained. Both openings of the stomach are normally easily closed by the tonus of the sphincters. The cardia opens in the act of swallowing as the last link in the chain of movements. If the finger is introduced from the stomach into the cardia, rhythmical contractions can be felt like those of the sphincter ani after section of the spinal cord.

All these different movements are not, as already remarked, quite put an end to by section of all the nerves going to the stomach, but they are enfeebled, and the slight regularity and co-ordination which they formerly showed is quite lost. If the vagus of a mammal be stimulated peristaltic movements commence in the stomach, or when already present they become stronger. The pylorus appears as a rule to be thrown into a state of strong contraction, but it has not been always observed that there is at the same time permanent contraction of the cardia. According to most observers the action of the sympathetic is also that of an exciter of movement, though in a much feebler degree. The spontaneous movements of the pylorus are, on the other hand, suppressed when the splanchnics are irritated in the abdominal cavity (Oser).

But these irritation experiments on mammals have all alike a character of obscurity and uncertainty. Their result is generally no greater, and above all things not more constant.[*]

A completely clear and quite satisfactory experiment can only be made in the frog, and it may be said that this is almost the only experiment on the influence of the nerves on the movements of the stomach that has a constant result. I mean the experiment of Goltz and Rosenkranz, which was described in the first part of this book (p. 64). In spite of the warning of Goltz, this experiment is nearly always falsely interpreted. It actually has to do with an irritation which arises through the destruction of the brain and spinal cord, and which passes to the stomach through the vagi. The same results may be obtained by exposing the vagus and stimulating it directly.

Vomiting.—Magendie maintained that vomiting was exclusively an action of the abdominal muscles with which the stomach had nothing to do. He substituted for the stomach a pig's bladder, the contents of which were vomited after injection of tartar emetic into the blood. Tantini, however, showed that this experiment does not succeed if the cardia is left attached to the œsophagus. Otherwise the cardia opens actively during vomiting, in the way already described. Contemporaneously with the opening of the cardia the pylorus becomes tightly closed, and strong peristaltic, and especially antiperistaltic waves course over the stomach. The action of the striped muscles accompanies these movements of the stomach. The diaphragm moves down and flattens itself. The abdominal muscles press in part directly upon the stomach, in part indirectly, by pressing on the entire contents of the abdominal cavity. The larynx sinks down, the base of the tongue sinks, and the upper part of the body bends forward. All these movements have an object, to facilitate the expulsion of the stomach contents. We may certainly say that it is chiefly the abdominal pressure which exerts the force necessary to expel the stomach contents. This is distinctly shown by the ease with which children vomit. They may be seen to vomit fluid matter in a continuous stream, which could not be caused by the peristaltic action of the stomach. It must be added that as age advances, especially as the abdomen gets loaded with fat, the capacity for vomiting greatly diminishes, and even sometimes at the student age, in spite of the greatest desire to vomit, the act itself is only possible when artificial pressure is applied to the abdomen.

---

[*] This want of harmony is not wanting in recent positive data (compare, for example, the references of R. Kobert in Schmidt's Jahrbücher (Bd. 211, p. 244, and Bd. 215, p. 12) which have still to be confirmed.

Respecting the nerves which play a part in the act of vomiting, we shall consider only those connected with the stomach. Mechanical and electrical stimulation affecting the mucous membrane of the stomach easily excites the act of vomiting, and it apparently effects this through the intermediation of the sympathetic to the vomiting centre in the medulla. This has not hitherto been proved respecting other sensory stimuli, and it appears that most emetics after entering into the blood act directly on the centre. The centrifugal impulses which the stomach receives in vomiting run through the vagus, and act so that the stomach movements are co-ordinated with the other muscular contractions appertaining to the act of vomiting. After section of the vagus this co-ordination ceases, and vomiting becomes, if not impossible, at least very difficult. It happens then only if the cardia happens to be open when the abdominal pressure rises.

Sensibility.—Without question the stomach is sensitive on both its mucous and serous surfaces. A hard œsophageal sound is felt at the moment it strikes the stomach wall. In the same way the patient perceives the thermo-cautery in the production of a fistulous opening when it touches the outside of the stomach. This sensitiveness is however slight, and requires very strong stimulation to produce it. Under normal conditions we are not conscious of our stomachs. We do not feel the weight of food, the place where it lies in the stomach, or its temperature, or its chemical composition, whether acid, alkaline, or pungent, or even the peristaltic movements to which it gives rise. But the above-mentioned strong stimuli prove that even the healthy stomach is not quite destitute of sensation; and as all sensory nerves are excitable by means of four different stimuli, namely, mechanical, electrical, thermal, and chemical stimuli, we assume that this is true also of the sensory nerves of the stomach. In fact the action of electrical and chemical stimuli on the normal stomach has been demonstrated, so that as it feels the sound and the thermo-cautery, all four kinds of stimuli are actually proved to act. Owing to the thinness of the walls of the stomach it is sometimes difficult to determine whether the sensation is perceived by the outer or the inner surface, indeed it has been suggested that in certain cases, for example, in the perception of the temperature of ingesta, it is not at all a question of sensation in the stomach, but in the abdominal integument. Though this may be correct under certain circumstances, the important fact remains that stimuli are perceived by the gastric mucous membrane.

In pathological conditions sensibility is sometimes abnormally increased, not merely when the nerves are exposed, as in ulcer, cancer, &c. Under such circumstances irritating food introduced into the stomach causes painful sensations, and touching the stomach wall with a sound causes very disagreeable feelings. With respect to later statements we may add that normally we do not feel whether the stomach is empty or not, but that we feel when the stomach is very full in consequence of its distention and the stretching of the stomach wall.

All these conscious sensations pass through the vagus. If all the vagus fibres are divided there remains no sort of consciousness of any sensation in the stomach.

Hunger.—The question of the cause and the localisation of the sensation of hunger is best included in the description of the sensibility of the stomach. At one time the stomach was generally regarded as the exciter of hunger. For example, Haller attributed hunger to the sensation caused by the walls of the empty stomach rubbing against each other. But hunger is a general sensation. It is caused by want of nutriment in the blood, and has been justly described as the appeal of impoverished tissue exchange to the brain. Corresponding to this cause is the fact that it can only be appeased by the introduction of fresh nutriment into the blood. It has been proved in animals that hunger may be allayed by injecting nutritive matter into the blood. The experiment succeeds more easily with the analogous sensation, thirst, by injecting water. This sensation is easily removed.

In recent times many contradictory theories have been broached of which we shall mention only the most important. Thus hunger is said to be caused by an empty stomach. But rabbits, guinea-pigs, and other herbivora never have empty stomachs. No doubt there is a difference in the degree of fulness, as between one meal and the next, a portion of the contents is expelled through the pylorus. But we cannot speak of relative emptiness of the stomach as a cause of hunger. In the carnivora the stomach is empty for hours before hunger occurs, and the new-born child exhibits hunger some time after the umbilical cord is tied, although the stomach normally has been quite empty up to this time, without giving rise to any sensation of hunger.

Not only the mere emptiness of the stomach, but the increased peristalsis thereby occasioned, or the diminished secretion of gastric juice, or the accumulation of secretion in the gastric glands, have been made answerable for the sensation of hunger. But all these hypotheses are opposed to direct observations, and cannot be adduced in explanation of the sensation of hunger. In addition the results of section of the vagi support the view that hunger is a general feeling, as it occurs when all their fibres have been divided, though, as already stated, there can then be no conscious perception of any feelings in the stomach.

When the vagus is divided the sympathetic remains, of which it is generally accepted that it does not permit reflexes to reach consciousness, and it has been doubted whether after the cessation of perceptible stimuli in the stomach by section of the vagi other excitants of this organ, which do not as such reach consciousness, act on the central parts and cause the sensation of hunger. But after section of both vagus and sympathetic hunger exists. The hunger centre, therefore, has no connection with the stomach.

Where then must we seek this hunger centre? At any rate not in the cerebrum or cerebellum. Monstrosities born without these parts have given distinct signs of the existence of hunger. Some time ago pigeons deprived of their cerebral hemispheres were never seen voluntarily to take food, and as they made no movements suggesting hunger, and allowed themselves to die quietly on a heap of peas, it was thought that the sensation of hunger was abolished with the removal of the cerebrum. But it is necessary to be very cautious and to go slowly to work in experiments on the brain. A year after the operation, the writer of these lines was the first, as it appears, to see a pigeon recover from the sad plight caused by the destruction of its cerebrum, and voluntarily to take solid and fluid food; this experience was corrected by Schrader, who said that pigeons only learn again to feed themselves when small portions of the frontal lobes remain. On the other hand, the same author saw frogs completely deprived of their brains catch flies to eat them. The hunger centre does not at any rate lie in the cerebrum, and it has therefore very justly been localised in the medulla; it appears that it is directly stimulated by the blood without the intervention of the peripheral nerves when the quantity of nutriment in the blood has been sufficiently reduced by being given up to the tissues.

How can this be harmonised with the fact that most persons localise the sense of hunger in a particular spot? A comparison with other general sensations which are recognised as such by everybody, shows us how easily such general sensations are connected with local feelings. When we are tired we feel, in addition to the general drowsiness and tendency to sleep, a heaviness in the eyelids which is often accompanied by slight itching or burning. In this case we feel quite distinctly that the localised feeling in the eyes only accompanies the general weariness, but in hunger the general feeling is so indefinite that it is commonly confounded with the accompanying local sensation.

In consequence of this, hunger is by most persons localised with more or less certainty in some definite part of the body. Schiff's statements are very interesting upon this point. He asked a great number of soldiers where they felt hunger. Some gave the chest and neck, twenty-three the sternum, four could not localise it, and two named the stomach. Without question, great individual differences exist, not only in reference to the supposed seat of the sensation of hunger, but also as to its strength. Whilst some describe the strongest sensation of hunger which they have ever experienced after a long fast as a feeble, indistinct sense of weight, in others every ordinary meal-time is preceded by strong and actually painful sensations. In most persons capable of sufficient self-observation, hunger appears to occur in the form of a faint feeling of weight in the stomach region. This localised sensation accompanying the general feeling of hunger is a central sensation, that is, it is one caused by stimulation of the centre itself without the intervention of the peripheral nerves. The central stimulus is then transferred centrifugally, that is, we wrongly localise the cause of our feeling at the periphery. Such or similar centrifugal transferences often occur; for example when we strike the ulnar nerve and feel pain in the little finger. In this case, however, the stimulus does not affect the centre, as in hunger, but only a part of the nerve which lies nearer the centre than the spot to which the sensation is referred.

Against the view that the localised sensation of hunger is really central, it may be urged that actual local stimulation of the stomach occasions most distinct feelings of hunger. For example, the first effect of a growing stomach cancer resembles hunger. But why may not a centrifugal sensation be imitated by one that is peripheral? If we put our fingers on the spokes of a very rapidly rotating wheel, we sometimes experience a feeling resembling that of a finger which has gone to sleep. Besides, hunger disappears suddenly, for example, from disgust, and it is very improbable that a sensation originating in a local stimulus could be arrested by the strongest psychical influence. In the heat of battle a man may certainly not feel a wound even when his attention is turned to it. But here we have to do with a stimulus which completely alters the mind. If only a feeble stimulus is acting on us, and we receive a surprising piece of news, for example, it may affect us very much, joyfully or painfully, but we can say with absolute certainty that we are still able to state whether in any particular part of the body, let us take the finger for instance, there is any abnormal sensation or not, and our judgment is as good as usual. In any case in such an event we can overcome any arrest of sensation in the finger which the psychical stimulus may have occasioned, by directing attention to the finger. But if hunger—or rather the sensation of hunger—has left us from a psychical cause we may sit down to table, desire to eat, and concentrate all our attention on our appetite, but the sensation of hunger has departed and does not return. And what slight stimuli suffice for this in many persons! The news that a dear friend has arrived, a fly which has fallen in the soup, the description of unappetising things frequently suffice. And how remarkable! It is possible to spoil anyone's appetite by relating suitable stories, and to succeed in spite of the anxiety of the hungry person not to let himself be influenced. But we shall always in vain try to disturb those sensations which are due to peripheral stimuli, even when they are weak, and it is equally impossible whether they originate on the inside or the outside of the body to arrest them by such slight psychical action. As the attention turns to the particular part, the abnormal sensation always returns with it.

It is otherwise with sensations which are of central origin. By careful observation it may occasionally be found that headache entirely disappears in consequence of slight psychical stimuli, and perhaps still more remarkable is the disappearance of the feeling of drowsiness which so often occurs, owing to some psychical cause, and is then so vainly wooed back again. Therefore I consider it certain that the sensation of hunger is purely central in its nature, and that it is only indirectly connected with the "stomach grumbling," which occurs when that organ is empty.

In the same way as we can drive away sleep for a short time when we cause the sensation by which it appears to be localised to disappear, we can also accomplish the same with hunger. If we wash our eyes with water we drive away sleep. If indigestible food is introduced into the stomach, or it is compressed by tightening the waistband, as is often seen among the people, hunger may be driven away, but both sensations are only treated to a certain extent symptomatically, and are not actually removed. Their treatment rests upon the frequently observed fact that one can drive out one sensation by another stronger, produced in the same place, or at least in the place to which it is centrifugally referred.

If we can cause this symptom of hunger, of which we are most distinctly conscious, to disappear, hunger itself can only be appeased by the introduction of nutriment into the blood. But this is generally known by the following fact: if we are very hungry, perhaps we are obliged to wait beyond our usual meal-time so that our stomach "grumbles," we yawn, and feel "quite weak," and experience the usual sensations of want of food, yet a few mouthfuls will suffice to appease hunger and to rid us of these disagreeable feelings. Can sufficient food have been taken in so short a time as to appease hunger? By no means. It is only that the most obvious symptoms of hunger are arrested, just as they may be by taking indigestible food or by tightening a belt. When we take a meal we first allay the striking symptoms of hunger, but we are not satisfied, and hunger proper is only appeased in the course of the meal and its subsequent digestion. The state of the blood must indicate that the wants of the body are satisfied, by no longer exciting the above-mentioned hunger centre, to which all the symptoms of hunger are due.

Against this theory of satiation, which describes satiation as a state of rest of the hunger centre, and therefore a sensation that cannot possibly be increased, as it is purely negative, we must place the circumstance that after a full meal we may feel, I might say, more than satisfied. But before this objection can be allowed it must be shown that the feeling is due to a greater accumulation of nutriment in the blood than is needed for satiation. This is obviously not the case. We have no means of feeling whether more nutriment than is properly needed is circulating in the blood, any more than we can feel after we have been once fully awakened whether our sleep has been long or short. At the end of a meal we do not know that the requirements of our body are satisfied, and indications are wanting to tell us whether we shall feel hungry sooner or later. What makes us feel more or less satiated at the end of a meal is only the repletion of the stomach, for which we have, as above-mentioned (p. 570), a special sensation. But whether the stomach feels to us especially full or not, depends chiefly upon the ordinary size of our meals. If we give an Irish peasant, accustomed to fill his stomach with potatoes, only meat and white bread, he will not feel satisfied until he has taken a very much larger quantity of nutriment than would constitute his usual meal, and he will not feel any sense of over-repletion because his stomach is less full than usual. If, on the other hand, we give to a meat-eating man some feebly nutritious food he will experience the sensation of over-repletion when his stomach is more than usually full, although he has taken much less nutriment than usual. So that the feeling of repletion is actually no increase of the sensation of being satisfied, but a new positive feeling caused by more than ordinary fulness of the stomach, and to a certain extent acts as a warning not to over-load the stomach.

In conclusion, we have to say a word about the appetite. We may again draw the comparison between hunger and general weariness. When we are weary it is necessary, in order that sleep may come, that certain parts of the brain should not be excited. The absence of these excitants puts us in the condition of sleepiness. We have not only the wish to sleep, we feel not only the need to sleep, but we also feel that sleep will come if we remain passive. The exertions which have wearied us may, however, be continued so long that they become irritants. Then we are over-tired. In the same way certain emotional movements may become irritating, and in both cases we feel the greatest desire for sleep without being able to do so, that is, without being sleepy.

Appetite stands in just the same relation to hunger that sleepiness does to sleep. Under normal conditions both sensations, hunger and appetite, accompany and precede the taking of food, but we may be over-hungry, just as we may be over-tired. We have already spoken of the psychical stimuli which repress the sensation of hunger. Sensory irritants act in the same way on sleepiness and on appetite. Just as washing with cold water makes us awake, so a disagreeable smell or taste spoils the appetite. But finally sleep, like hunger, overcomes all obstacles and insists on its due.

We must also state that quite a series of other centres which are excited from the hunger centre by the poorly nourished blood, so as to give rise to notable symptoms of hunger, are set in action, and that the activity of these centres is essential to the occurrence of hunger. If we have no appetite, if, for example, we are over-hungry, these centres are controlled. The distinct symptoms of hunger which invite us to eat are wanting, and only a general obscure feeling tells us that we are not satisfied. But the importance of appetite does not consist only in inviting us to take food, and in a preference for certain foods (we ought to have for thirst a sensation quite analogous to appetite, but this is not the case, as there is no word for it in any language), but appetite sometimes capriciously excludes certain foods which at other times are willingly eaten, and this is very characteristio. Only to mention one of many instances, during jaundice there is often a very marked dislike to fats. The sight of butter may cause loathing even in persons who previously ate butter and fatty food. I do not know of similar observations in respect to drinks, so far as they serve to quench thirst, and are not, like milk or chocolate, of some special nutritive value. A dislike to fluids which would be otherwise gladly taken, only occurs when they have been drunk to excess.

There must be a whole series of special centres in activity in relation to the taking of nutriment, by virtue of which the process becomes easy and agreeable. To this series belong the centres for taste and smell, for salivary secretion, for voluntary and involuntary deglutition, &c., and we have a quite definite sensation which tells us whether any particular food influences these centres favourably or unfavourably. The idea of the food acts as well as the food itself, but more feebly. When the smell or taste of any kind of food is disagreeable, we notice at once that the saliva diminishes, deglutition is checked (a sensation that in its highest degree is described as the feeling of rising of the gorge), and the appetite turns against it. This explains why the analogous feeling of appetite is absent, or is only very feebly present, in thirst, for the simple reason that in drinking these centres are partly unnecessary, for example, the salivary centre; partly they are less needed, as is the case with the movements of deglutition in taking fluid food. But naturally a favourable influence of these centres can direct the appetite towards certain food.

The appetite appears to me to depend on—

1. Stimulation of those centres which give rise to the symptoms of hunger, and which are stimulated from the proper hunger centre; 2. A favourable or unfavourable stimulating or controlling influence of the centres which participate in the taking of food.

F. RICHARD EWALD.

LECTURE X.

THE NEUROSES OF THE STOMACH.

GENTLEMEN,—The neuroses of the stomach are either to be directly attributed to the stomach as the primary seat of the disorder, or they occur reflexly from parts outside it, such as the brain, spinal cord, uterus, kidneys, liver, &c., so that the nervous centres in the stomach are either directly or reflexly excited. Still, Oser has remarked that stringent proof of this cannot, in most cases, be obtained, and he instances as an example the reflex cardialgias of uterine disease, where both affections, those of the uterus and stomach, run quite as much concurrently as in any causal relation to one another.

If in the following table, in which the different neuroses are grouped, I have chosen a middle course between a purely symptomatical and an etiological classification, it is because this gives a better survey of them.

The neuroses of the stomach.

I. IRRITATIVE CONDITIONS.

a. **Sensory Sphere**	*b.* **Secreting Sphere**	*c.* **Motor Sphere**
Hyperæsthesia	Hyperacidity	Eructation
Nausea	(Hyperchlorhydria)	Pyrosis
Hyperorexia	Hypersecretion	Vomiting
Anorexia ex hyperæsthesia		Cramps
		Tormina ventriculi
Parorexia		
Gastralgia		

II. DEPRESSIVE CONDITIONS.

Anæsthesia	Hyperacidity	Atony
Polyphagia	(Hypochlorhydria)	Insufficiency of the pylorus and cardia
	Anacidity	

III. MIXED FORMS.

Neurasthenia gastro-intestinalis (Dyspepsia nervosa).

IV. REFLEXES FROM OTHER ORGANS.

Brain, spinal cord, kidneys, liver, sexual organs, intestine, besides those named under I. and II.*

---

* A very similar table is given by Garland in a paper published some time after the first edition of this book—See Gastric Neurasthenia, Boston Medical and Surgical Journal, October 30th, 1887.

Gentlemen, if we now go seriatim through the various neuroses enumerated in this table we must not forget that they only rarely occur as independent diseases, but usually are associated either concurrently or consequently in the course of a disease. The most different conditions pass before us like a changing picture, presenting a constantly new aspect. In order to avoid repetition it may be stated once for all that these diseases *chiefly, but not at all exclusively, affect females*, and are more common in early life than in advanced age. I need scarcely point out that this depends upon the greater tendency of women to functional disorders, and the greater frequency of this before than after the climacteric period. In both sexes, middle age, from twenty onwards, is that most often affected; they occur less frequently in the earlier years, and most rarely on the other side of fifty.

No such constant rule can be laid down respecting the condition of the patient. We meet with patients with severe disturbances of nutrition—miserably thin anæmic persons with flabby white skins, prominent veins, dull eyes, weak voices, feeble movements, shuffling gaits, even bed-ridden—and, on the other hand, we are surprised to see people enter our consulting room who appear fresh and lively, with the ruddy glow of health in their cheeks, but who complain of quite a host of nervous troubles. Moreover, not without exception is the well-known experience that the material for stomach neuroses is chiefly met with in great towns and among the better educated classes, with whom the struggle for existence, over-work, and the complicated demands of progressive culture are sources of nervous irritation. I have met with very severe neuroses in persons of the lower classes, small tradesmen or their wives, maid-servants, factory workers, even among sailors, where one would certainly never expect them.

Most cases can easily be recognised as having their chief dependence upon some strong nervous excitement: in men, professional labours; in women, absolute or relative excessive indulgence in the pleasures of society; in both sexes, immoderate indulgence in sexual intercourse. Periodically recurring neuroses are not uncommonly connected with the periodical increase of these causes; as the burden of work or pleasure increases at certain seasons, and at others is less, so these nervous phenomena increase and diminish or disappear. Stiller has observed a recrudescence of neuroses in his patients in the spring, while mine has occurred chiefly at the end of the winter. But as a long time is always allowed to elapse before advice is sought, we could conclude little from this as to the occasioning causes of these diseases if the patients did not so frequently state that in the quiet time of the year they are relatively or quite well.

Almost as a rule, in addition to the particular stomach troubles, these patients have symptoms of general nervous disturbance, which are no doubt often kept in the background, or are regarded as having so little to do with the particular malady, that they are only brought to light on careful examination. A so-called nervous temperament—headaches of different positions and characters, inability to do brain work, depression of spirits, slowness of ideas, bad memory, absence of mind, giddiness and its peculiar variety, agarophobia, sleeplessness, neuralgias and paræsthesias, especially of the trigeminus and in the lower extremities, inequalities of the pupils, signs of spinal irritation, intercostal neuralgias, weakness of the bladder, and ovarian pain; any of these may be discovered, and prove the patient to belong to the great group of neurasthenics. If there occur mental disturbances, ramifying into the most different nerve areas, such as are associated with the capricious and confused picture of hysteria, they point to another not much less frequent basis. It is certainly not possible in every case to draw a sharp line between neurasthenia and hysteria. The best-marked cases in either category are easily classified, but there is a border-land in which the diagnosis must be left to the instinct, I might say the tact of the physician. It is sufficient to maintain that the neuroses of the stomach are, as a rule, if not in all cases, a symptom of general nervous disorder in its widest sense, of neurasthenia and hysteria, and as an important deduction from this fact we may draw the conclusion *that treatment should be directed to the general health, and not to the prominent symptoms.* So that the therapeutic measures employed in these circumstances acquire a somewhat monotonous character, in which the great group of nervines, including medicinal and dietetic remedies, constitutes the constantly recurring means. I shall therefore discuss the treatment of all the neuroses of the stomach at the conclusion of this chapter.

I.—IRRITATIVE CONDITIONS.

Let us turn now from general considerations to consider especially the various disorders of sensation, of which the most trifling is *hyperæsthesia* of the stomach, which expresses itself by a feeling of fulness, weight, and tension in the parts, and is called "feeling sick." These sensations are in part so nearly normal, and are of such common occurrence in every possible affection of the intestinal tract, that from the full stomach after a good dinner and the poisonous effects of a strong cigar to the incessant feelings of weight and fulness in the stomach region which occur in many cancer patients, or the burning and sickness of hysteria, cerebral irritation, brain tumours, or other diseases of the central nervous system, they include the entire scale of stomach diseases. Under these circumstances, that is, as the accompaniments of other disorders, we are not concerned with them here, where we intend to discuss only genuine neuroses. The difficulty lies, however, in rightly distinguishing the latter, in recognising the independent existence of the symptoms in question; in a word, in differentiating it as hyperæsthesia of the stomach.

This can only be done by employing all the means of differential diagnosis, so as carefully to exclude, by a thorough examination, the presence of organic disease. Recollect that many patients, either from inattention, or because they actually localise them falsely, refer to their stomachs pains which have their seat in the epigastrium (the so-called epigastric pain of Briquet, myalgia of the abdominal muscles), in consequence of cutaneous hyperæsthesia or rheumatism of the muscles, or originate in the spinal column. In consequence of defective self-observation, from which a great part of the public suffers, patients are not very exact in localising their pains; this is an everyday observation, and, in consequence, I always ask to have the painful spot not only described but pointed out. Oser has frequently seen subjects of tabes without "crises gastriques," who localised their disorder in the "stomach." The girdle feeling which they perceived in the epigastrium was regarded as a stomach sensation.

The knowledge of hyperæsthetic conditions of the gastric mucous membrane is, however, very old. Todd[*] quotes examples from Hippocrates and Aretæus. Schmidtmann* and Barras† know them, the latter notably under the name of dyspepsia. Pemberton held the condition to be muscular inability, and J. Johnson described it as "morbid sensibility of the stomach," while Todd described this group of cases as "irritable gastric dyspepsia." The characteristic of hyperæsthesia is increased irritability of the stomach, and we must assume too that the usually patient nerve endings in the mucosa answer by severe pain to the smallest irritation, quite within normal limits, and even without the occurrence of direct irritation. Whilst in health we are not conscious of the presence, much less of the activity, of our stomach, there is, under these circumstances, a persistent feeling of heat or cold, gnawing, twisting, burning, &c., which can so obtrude itself in the foreground of the vegetative and psychical life of the patient, that all sensation—everything to which his attention is directed—assumes a relation to his stomach. "Le principe de tous mes maux est dans mon ventre; il est tellement sensible que peine, douleur, plaisir, en un mot toute espèce d'affections morales ont là leur principe. Je pense par le ventre si je puis m'exprimer ainsi," writes a lady to Pinel, and thus sketches admirably a condition which was later named hypochondria, and which certainly has its seat in most cases in the hypochondrium, but undoubtedly also depends upon hyperæsthesia of the stomach.

---

[*] Todd, l.c., p. 633.

The nervous nature of these disorders is attested by their being sometimes allayed by taking food, and becoming severe again when the stomach is empty, though as a rule the reverse occurs, that is, the pains are worse during digestion. Sometimes they occur first after eating, even after very small quantities, *e.g.*, a mouthful of water. Everything is then vomited, and medicines which ordinarily are well borne, cause severe pain, cold sweats, even convulsions and collapse; mild aperients are followed by severe diarrhœa. Sometimes the hyperæsthesia has had a distinct cause. For example, it has been observed after chloroform-narcosis. Lately I saw the following case: In a young woman aged twenty-eight, suffering from tabes, carcinoma of the anterior lip of the os uteri occurred and was removed under chloroform. Her appetite and digestion had been good before the operation; after it she remained for three days in a state in which she complained of severe burning in the stomach with unquenchable thirst, and after a short time she vomited everything she took. I examined the vomit—it consisted of weak coffee—many times on the day after the operation, and could demonstrate hydrochloric acid each time. Neither ice pills and morphia injections, nor large doses of morphia and cocaine given internally, produced any effect. A few days only before death the vomiting, which had never occurred spontaneously, ceased. The *post-mortem* examination showed that there was no peritonitis, which we expected to find as the cause of the uncontrollable vomiting. There must have been some acute irritation of central nervous origin. This may occur in a chronic form for one series of these affections, whilst for the other a peripheral cause exists. Persistent defective food and sudden limitations of diet are assigned as causes; hyperæsthesia of the stomach occurs in Catholic priests, fakirs, and Brahmins in consequence of fasting; debauchery and feeble physique favour its occurrence. On the other hand, material causes are blamed, such as gastric calculi, the famous *concretiones bezoarticæ*, and worms. In most cases we shall look in vain for a cause. For example, I have at present a gentleman under treatment; he is a young, strong, well-to-do man of thirty, in whom this condition of things has arisen without any cause except a transient gastric catarrh.

---

* J. Schmidtmann. Summa observationum medicarum ex praxi clinica triginta annorum. Berolini, 1819-26.

† Barras. Traité sur les gastralgies et entéralgies. Paris, 1827.

The *idiosyncrasies* must be reckoned among the hyperæsthesias. In predisposed persons it is well known that certain foods cause peculiar sensations in the stomach, slight oppression or burning, slight nausea combined with peculiar irritation of the cutaneous nerves, itching, erythema and urticaria, even headache and slight febrile movements, which either soon disappear spontaneously, or are suppressed by strong stimulants to the gastric mucous membrane, such as a glass of strong wine, brandy, &c. Most frequently this condition occurs after eating shellfish, crabs, lobsters, crayfish, or oysters, also after strawberries or green peas. There can be no question of a psychosis, but there is an abnormal sensitiveness of the gastric nerves which are deranged by the particular article of food. The condition occurs for the first time quite accidentally, and happens again although the person does not think at all of the consequence of what he is eating, or has forgotten it. A peculiar condition, which comes within the range of idiosyncrasies, occurred in a gentleman who suffered severe migraine-like headache, with muscæ, flatulence, and diarrhœa, from eating "the smallest quantity of fat." This occurred twelve to fourteen hours after eating the fatty food, but the meaning of "fatty" is obviously open to great variations, and can refer only to the more or less fatty condition of ordinary food. It is very characteristic of a neurosis that the patient could eat pure table butter without suffering any pain, but if he ate melted butter these accidents occurred! Otherwise his appetite was that of a vigorous man of fifty-one, belonging to the best society; there was no gastric pain, and his bowels were ordinarily regular and normal. In order to exclude any idea of defective digestion of fat, the stools were examined on three occasions by extraction with ether, and their fatty contents were found to be normal. This patient had suffered for years from these symptoms; he was, according to his own account, "very nervous," and had obtained no benefit from either mountain or sea air, the use of Carlsbad and Kissingen waters, or preparations of pancreatine and the like.

A second group of sensations, which, starting from a normal feeling, become morbid by its gradual increase, occurs in the form of *morbid appetite*. There are people who get on very well with two meals a day—a good breakfast, and a dinner at six or seven in the evening; there are others who must eat every three or four hours. If they do not get food they have a feeling of emptiness and weakness which may amount in nervous individuals to faintness, the *défaillance* of the French. I have treated a Government office clerk, who was completely unable even to glance at his newspaper if his breakfast was not ready to the minute. The exaggeration of this condition is *bulimia* and cynorexia, or *fames canina* (from λιμός, hunger, and *βοῦς*, bull),* or hyperorexia (*ὄρεξις*, desire), *morbid appetite or wolf-hunger.* Sometimes transient and still closely related to the normal sensations; sometimes persistent, it forms in the latter case an extremely obstinate anomaly, which constitutes a serious and more than disagreeable disorder. Alone, or as a symptom of the most different affections of the nervous system, it is observed in unmistakable brain diseases, in hysteria, neurasthenia, and other psychoses; it complicates constitutional disorders, such as diabetes and morbus Addisonii; it is a transient occurrence in convalescence from acute diseases, after weakening ailments, profuse losses of blood, peripheral irritations, *e.g.*, irritation from worms (Pavy), in uterine disorders, and even in syphilis. The chief interest obviously attaches to the cases in the first category, where the bulimia occurs as the sole affection. Potton[*] has recorded the case of a hysterical girl of eighteen who ate ten to twelve kilogrammes (20 to 24 lbs.) daily in the course of eleven or twelve meals. She drank little, but sleep was often interrupted by the desire to eat. Her stools were never loose, but were copious and frequent, and the urine was normal. The size of the patient increased, but her strength failed. She was cured by large doses of morphine, as much as 0·4 grm. (6 grains), in twenty-four hours. In another case morphine was useless, but large doses of opium (up to 3 grms.!) (45 grains) effected a cure.

---

* I follow the etymology of Roth-Gessler's "klinischen Terminologie." Erlangen, 1884.

Peyer[†] has recorded the case of a woman of thirty-two who was so suddenly attacked by violent wolf-hunger that she could not return home from a neighbouring house where she was on a visit. She devoured with trembling eagerness, in three-quarters of an hour, three pints of milk, twenty-three eggs, and two pints of strong wine, which Peyer administered to her. After that she became quieter, fell asleep, and the next day she was quite well. She described her attack as an unspeakable feeling of pain and soreness in the stomach accompanied by hunger; she believed she must die; the food she swallowed caused no sensation as it entered her stomach, and did not relieve her condition. The strong wine first relieved it. In this case the attack had been immediately preceded by severe mental emotion and grief.

I have treated for years a young lawyer who, though the picture of blooming health, and, who is mentally and bodily in every

[*] Potton. Études et observations sur la boulimie dyspeptique. Gaz. méd. de Lyon, 1863, 1 Juin.

[†] A. Peyer. Beitrag zur Kenntniss der Neurosen des Magens und des Darms. Correspondenzbl. schweiz. Aerzte, 1888, No. 20.

respect normal, is yet plagued by constantly recurring attacks of bulimia. The hunger comes on when he has had no food for two or three hours, especially often in the morning, when it awakes him from sleep. He is then quite incapable of working, or even of conversing. His whole being and thought are concentrated on as soon as possible satisfying his gnawing hunger. Small mouthfuls or a drink of strong wine effect this for a time, but very soon his tormentor returns with increased force. The intervals were longest when the patient took vigorous bodily exercise, so that during his military service he suffered only slightly. While leading a sedentary life his attacks became so violent and so distressing that the patient submitted for months to the most varied therapeutic measures, such as faradisation of the stomach, regular washing out of the organ, &c., unfortunately without any visible result, but temporary relief was most quickly obtained by large doses of bromide of potassium.

Rosenthal relates still other examples in connection with migraine, hypochondria, and Graves' disease. Marked brain lesions can, as already mentioned, be followed by wolf-hunger. The last-named author attributes one case to cerebral embolism occurring in initial insufficiency and cardiac hypertrophy. In another the bulimia was the result of cerebral concussion, but came on after the symptoms of concussion had passed off and some three months had elapsed. Allied to bulimia is the condition of perverted appetite, such as we are acquainted with in pregnancy, childhood, and mental disorders.

Guipon[*] holds bulimia to be an abnormal excess of digestive vigour, which in spite of the larger quantities of food taken is not in a condition "to repair the deficit in the economy."

I maintain, as stated on p. 556 et seq., that it is not necessary to give myself up to conjectures respecting the seat of this and other neuroses, so far as by this is understood their exact localisation. That we have to do with central and not with peripheral causes, follows from the simple circumstance that any trifle introduced into the stomach, a piece of bread, a cake, or a draught of wine, can momentarily allay this hunger, although there can be no question of actually satisfying the desire for food; and on the other hand, that it occurs at a time when the stomach still contains large quantities of food. This view is further supported by the cases reported to have followed injuries of the brain.

---

[*] Guipon. Des dyspepsies boulimiques et syncopales. Bull. de thérap. 1864, 15 août.

It was explained in the lecture on the innervation of the stomach, that we know nothing concerning the actual position of a "hunger centre," but it is probable that it should be looked for in the medulla. Rosenthal in his researches into the origin of the posterior roots of the vagus speaks in its favour, and supports his view by quoting a case of bulbar paralysis "with loss of the sense of satiety," observed by Senator,[*] in which atrophy of the posterior vagus nucleus was observed; unfortunately in the place quoted there is nothing about a loss of the feeling of satiety, but "that the patient, although just fed, complained of hunger and thirst." From this alone to conclude as to the position of the hunger centre seems to me not justifiable.

The foregoing examples show that bulimia may be divided into an acute and a chronic form. But chronic cases are only distinguished from the acute by being for the most part less severe, and by extending over weeks, months, or even years.

It might be thought that the stomach under these circumstances empties itself very quickly, and that this was the cause of the hunger, but in a case reported by Leo,[†] which I had an opportunity of observing for some time at the Augusta Hospital, we found that though the patient had typical bulimia, the stomach was in no sense empty, notwithstanding that we made repeated examinations, fifty minutes to an hour and a half after the test breakfast, as well as after full meals, in fact the ordinary quantity of stomach contents presenting normal conditions was expressed. On the other hand I have observed the case of a lady who sometimes is awakened every two hours through the night by hunger; her stomach is generally empty even of traces of food thirty to forty-five minutes after the test breakfast, and the salol reaction is distinctly accelerated (present in thirty minutes, very strong in forty-five), so that from these two cases it may be concluded that there exists no absolute rule in this respect.

By *anorexia* (ὄρεξις, desire) we understand *want of appetite* or *distaste for food*. These definitions do not coincide with each other, as it is somewhat different whether one has no appetite or feels no hunger, and whether food excites distaste or even loathing. Still the latter may be an exaggeration of the former sensation, and therefore they may remain under the same name.

---

[*] H. Senator. Apoplectische Bulbärparalyse mit wechselständiger Empfindungslähmung. Westphal's Archiv. Bd. xi., p. 713.

[†] —— Verein für innere Medicin. Berlin, 1889.

Almost all dyspeptic conditions are combined with anorexia. We have nothing to do with that here, as we are at present only concerned with the neuroses *κατ' ἐξοχην*. In the latter the anorexia may occur either spontaneously or in consequence of hyperæsthesia of the stomach, so that the causes may be either central or peripheral. They co-operate, so that the original anorexia, induced by cerebral disease, and the resulting disorder of nutrition cause hyperæsthesia of the gastric nerves, which may lead to alterations in the domain of mental processes; thus a vicious circle is established which may under certain conditions lead to the most serious consequences. At first, as a result of a perverse turn of mind, there is distaste for food, which may at the commencement be overcome by an effort of will, but soon it increases to actual aversion and disgust, and to almost complete refusal of food. Frequently the patient sits down to table with a good appetite, even with sharp hunger, but the first mouthful taken is followed by an overwhelming aversion to eat any more. In other cases there is no obvious desire to take food. "If I did not see others eat, and if I was not compelled to eat, I should never feel any want of it," is a frequent complaint of such patients. That nutrition thereby suffers, and that a morbid irritability of the gastric mucous membrane results is the inseparable result. We have arrived at the end of the circle when the over-sensitive mucosa revolts, refusing the brain its nourishment. If our patients only waste, look pale and ill, but preserve their strength tolerably, we may be contented, for severe cases lead to conditions of exhaustion of the most alarming kind, so that the patient is confined to bed by his weakness.

Great agitation and restlessness, which according to Fenwick are so surprisingly in contradiction to the wasting of the patient, have not shown themselves in my cases, but still appear to be under certain circumstances prominent features of the disease. A lady, as Fenwick relates, impelled by her restlessness, undertook quite objectless railway journeys, although she knew that the consequence would be that she would be laid up for several days with severe exhaustion.

The result is the same, though the beginning is different, when from hyperæsthesia of its sensory nerves the stomach becomes so sensitive that the patient gradually takes less and less solid food. In time this leads to disturbance of nutrition, which affects the higher centres. Strong emotional disturbances of a depressing nature are not unfrequently the first starting point, so that patients who were previously quite well can refer the beginning of their illness quite distinctly to a definite time, often to a definite day. The death of some one very dear, a great pain, disappointment in love, loss of fortune, disgust for a particular food, or a disgusting and unpleasantly served dish, &c., is here, as in many other neuroses, *e.g.*, nervous vomiting, the exciting cause. But this condition often occurs without any of these external causes. Young girls of the better classes form the majority of these patients, youths and men are exceptional. As chronic anorexia leads to great emaciation and weakness, even, as Fenwick [*] says, to death itself, its confusion with other constitutional diseases, especially with phthisis, has often occurred, and is all the more easy, as such patients in their exhausted condition have little resistance and are easily attacked by any infectious disease, so that they are predisposed to the occurrence of pneumonia, pleurisy, acute bronchitis, &c. A careful examination of the chest and heart is therefore of great importance, and should never be neglected. Still, tuberculosis appears to develop much less frequently than one would expect. I have watched, for six, four, and three years respectively, three cases of severe nervous anorexia, in which the patients, young girls, are confined to bed for the greater part of the year. Variations in their condition occur, transient improvement during or after visits to watering places, or spontaneously, or whilst a new medication or a new medical man is being tried, but on the whole the condition remains the same, without definite cure, but also without manifest complications. We may dismiss such cases with the epithet "hysteria," but this does not alter the fact that it is a severe affliction for those affected in this way.

Gastralgia or gastrodynia [†] (ὀδύνη, pain). Just as the causes of gastric pain may differ, so may the phenomena under which it occurs. This is completely explained according as the irritation of the vagus is in its peripheral terminations, or in its nucleus, or radiates from still higher centres. Gastralgia is due either to local causes, or to irritative conditions of nerve groups outside the stomach. The attacks of pain begin either with a feeling of discomfort, fulness and tension in the region of the stomach, or they occur directly and at once reach their fullest strength. Not uncommonly profuse salivation opens the scene—Oser knows a patient whose gastralgic attacks are always preceded by toothache. But when the same author mentions left-sided earache among the initial symptoms, this must be regarded as only an accidental coincidence, Gastralgia proper has the character of deep boring or cutting pain, sometimes sharply localised, sometimes more diffuse, or it may be a sort of girdle pain, or it may occur in severe attacks of extraordinary violence. The patient doubles himself up so as to relax the abdominal muscles, breathes superficially and anxiously, and avoids coughing or speaking loudly. Whilst distinct cutaneous hyperalgesia exists in the abdominal wall, deep pressure often relieves the pain. The face is pale, and covered with cold sweat, the expression that of suffering, while collapse with intense sensations of threatening death and fainting occur. The abdominal aorta pulsates strongly, pains radiate along the dorsal spine and occupy the intercostal spaces. Sometimes there are exquisitely painful spots to be discovered in the course of the spinal and lumbar nerves.

---

[*] Fenwick. On atrophy of the stomach and on the nervous affections of the digestive organs. London, 1880, p. 99.

[†] I avoid the expression "cardialgia," by which the pain is referred to a definite part of the stomach, which is going beyond our present knowledge.

Gastralgic attacks vary very much in their general features and duration, and may be very slight and transient, or amount to paroxysms which last for hours, and reduce the patient utterly until medical aid or nature brings relief. As a rule the attack exhausts itself and the patient gradually recovers, in other cases it terminates by vomiting, or immediately after the attack the patient, who shortly before loathed food, feels very hungry and longs to eat. After the attack the urine is generally clear and of low specific gravity. A feeling of great relaxation and exhaustion remains behind. Happily the attacks seldom recur soon, yet I have seen a case in which three or four attacks occurred in one day, and the patient's strength was reduced to the lowest ebb.

The causes of gastralgia are manifold in their kind, and may be arranged under the following headings:—

1. *Local causes (genuine gastralgias).* — In the chapter on

gastric ulcer I have already shown that there are follicular inflammations, hæmorrhages, and losses of substance in the mucous membrane, which do not present the classical signs of gastric ulcer, but whose proper symptom consists in a recurring gastralgia, which does not come on every time food is taken, but certainly as a rule stands in relation to eating. Undoubtedly it is characteristic of nervous gastralgia that it has nothing to do with taking food, so that these cases strictly do not belong here, but we are unable exactly to say which side they belong to, as every practitioner learns by experience that cases occur to which these criteria do not apply. The following case is an illustration: Miss v. B., of D., aged twenty-one, complains of gastralgic pains which have occurred at irregular intervals for the last six months. Sometimes they have lasted for weeks, sometimes only for days. Sometimes they were dependent on taking food, but this was not constantly the case. The attacks occurred frequently in the morning, awakening the patient from sleep; the pains were localised in the stomach or præcordia, they were not very violent; no history of ulcer. She did not suffer from migraine; the filtrate of the test breakfast gave 66 per cent. acidity, a quantity occupying the upper limits of the normal; no abnormal constituents. Objectively nothing to be discovered. No ovarian pain or painful pressure points. She did not look ill, and had lately gained in weight. She attributed the frequency of her attacks during the last few weeks to the results of the treatment in Berlin. Diagnosis: follicular ulceration of the gastric mucous membrane. Prescription: rest.

Four weeks later the patient left the sanatorium, having gained 4 kilos. (8 lbs.) in weight, and having had no attack for two weeks. She very soon married, and, according to later accounts, she has kept free from any further attack.

In cases like that just recorded, in spite of the apparently idiopathic character of the gastralgia, palpable anatomical processes are present. Another group of gastralgias is of a purely nervous nature, but not directly, or only in so far directly that the fundamental condition is a neurosis, and consists in the excessive production of acid gastric juice, which will be the subject of discussion later on. This very acid gastric juice obviously irritates the gastric nerves, so that typical gastralgia develops, for which no other cause than this can be discovered.

The genuine gastralgias shrink into an exceedingly small compass. My experience makes me very cautious about diagnosing idiopathic gastralgia, and I am disposed to believe that the cases so regarded by many authors would, when examined by our new methods, be found to occupy another place.

2. *Gastralgias resulting from diseases of the central nervous system.*—Whilst brain diseases obviously are only rarely accompanied by pain in the stomach—according to Rosenthal, scanty data on the subject are only to be found in Kruckenberg—the gastralgias in spinal diseases, the gastric crises in tabes, described by Charcot, have been recently much discussed since this famous French physician drew attention to them. At first announced as a clinically recognised fact, its anatomical basis has since been acquired by the demonstration of a sclerosing degeneration of the vagus nuclei or the vagus trunk by the labours of Kahler, Demange, Landouzy and Déjerine, Oppenheim, &c. Not only sclerosis of the posterior columns, but other diseases which attack the vagus nuclei, may cause gastralgia. Leyden enumerates it as a symptom of sub-acute myelitis; and Oser observed it in a case of pressure myelitis resulting from spinal caries.* If these gastralgias were nothing more than phenomena occurring in the course of tabes, the symptoms of which were fully developed, they would still be interesting, but they would not possess the importance which is due to the fact that they are not uncommonly its first symptom. This gives them a very great importance, and therefore it is that every case of nervous gastralgia requires a careful examination in this direction, which will in many cases discover other tabetic symptoms hitherto unnoticed by the patient. Rosenthal gives a typical specimen of this kind. A man, aged thirty-eight, was apparently attacked after severe fatigue by lumbar pain, slight weariness in the legs, and frequent violent cramp in the stomach. A consultant pronounced it spinal irritation, and advised the application of a magnet to the spine, which further on was transferred to the painful stomach. The gastric irritation was not subdued by the magnet, but increased to severe periodical attacks with cardialgia, causing faintness, and ac-

---

* l.c. p. 42.

companied by violent vomiting, rapid pulse (120), and painful twitchings of the extremities. The attacks lasted from six to eight days; the stomach trouble was diagnosed as gastritis, and a corresponding mechanical and medicinal treatment was undertaken without any obvious benefit. This was what the family attendant said when he brought the patient to me in the autumn of 1879. On examination I found slight sensitiveness of the spine to mechanical and electrical irritation, great diminution of the electro-cutaneous sensibility in the legs, and abnormal increase of the areas within which two points feel like one, amounting to 72—110 times; the hair of the legs could be plucked out in tufts without causing any pain, and the patellar reflexes were lost on both sides. There was some tenderness on pressure over the fundus of the stomach, no dilatation, appetite good. The patient in answer to my questions said he had at one time seen double, and that latterly he had been attacked by boring or lightning pains. I pronounced the condition to be tabes with crises gastriques, and advised mild galvanic and hydropathic treatment. Ultimately ataxy, paralysis of the bladder, and impotence supervened, and the patient died with symptoms of mental decay.

It has repeatedly occurred to me to discover in patients, who had been treated in vain for gastralgia by specialists in diseases of the stomach, the typical signs of tabes, absence of knee jerks, anæsthesiæ and paræsthesiæ, Romberg's sign (inability to stand with the eyes shut), loss of pupil reflex, and anæsthesia of the posterior wall of the pharynx.

3. *Gastralgias of constitutional origin.*—To this group belong the forms which occur in neurasthenia, hysteria, in certain psychoses, and in essential anæmia. As it is not only of great importance for diagnosis, but also for prognosis, to keep neurasthenia and hysteria apart, and as the current saying, "Neurasthenia is reasonable, but hysteria is unreasonable" is not quite sufficient, I will try in the following remarks to define these conditions so far as is important with respect to the gastralgic phenomena.

Neurasthenic gastralgia.—The expression asthenia was introduced by Brown, and employed afterwards by Broussais in the doctrine of irritations; it implied a feeble condition of an organ which expressed itself first in morbidly increased irritability, later in depression of its functional activity. The name neurasthenia shows that we have to do with a weakened condition of the nervous system and its results. When once established it makes itself known by a steadily progressive course, and seldom occurs without some enfeebling cause, over-irritation of the mind, severe affliction, sexual abuses, anæmia, &c. Rosenthal distinguishes sharply between the irritative and depressive forms, of which the former may be known by the previous symptoms of irritation, the latter through the evidences of depression. Both are connected together by numerous intermediate forms, and are characterised by the experienced neurologist in the following way: "The patients affected with irritative neurasthenia complain of diffuse or circumscribed headache, which (especially in certain cases) is combined with local hyperalgesia of the skin, and with acoustic and optic hyperæsthesia. A high degree of mental irritability, causeless depression and misery, incapacity to converse or read for long, all point to unusual cerebral irritability and exhaustion. Not less disagreeable for the patient is the periodical rachialgia, with painful pressure points in the neck, frequently between the shoulder-blades, seldom lower down. The spinous processes, and a part of the transverse processes, are specially sensitive to electrical irritation and to heat and cold. These secondary conditions of irritation in regions of the sensory roots may be more sharply and certainly determined by electrical exploration. I have generally found on the left side great sensitiveness to cathodal stimulation and faradic brushing, which extends half way round the body, over the painful pressure points in the way, and is very well marked. Wandering neuralgic pains, or paræsthesiæ in the upper and lower extremities, slight weariness and exhaustion on movement and exertion, distinct increase of cutaneous and patellar reflexes, disturbance of sleep and of appetite form the many pathological varieties of irritative neurasthenia, which, when localised in the thorax, is often accompanied by periodical cardialgia. Increased pain in the back, sensitiveness to pressure in the upper cervical and dorsal spine, and heaviness of the head, are frequent precursors of a periodically recurrent gastralgia. Not uncommonly there are regional hyperæsthesias of the trunk, and certain puncta dolorosa are more distinct or even more numerous. More or less quickly there is developed a pain in the region of the stomach of constantly increasing intensity. The pain is sometimes cramp-like, sometimes burning or boring, which, going through from the lower ribs, behind the epigastrium, besets the poor patient after the appearance of the above-described preliminary vaso-motor phenomena and indications of brain anæmia.

"On the other hand, the depressive form is of the following type: the patients complain of a troublesome feeling or pain that extends from the stomach over the abdomen after eating without any of the paroxysmal characters of painful gastralgia. The pain in the back is not so great or of such a neuralgic character; but, on the other hand, motor weariness, sexual feebleness, losses of semen, psychical depression, as well as atonic dyspepsia, are prominent. The not uncommon diagnosis of a circumscribed spinal meningitis is easy to correct, as in the latter disease violent widely extended pains in the back accompany the initial fever, tonic spasms of the cervical and dorsal muscles make each movement painful, contractures and paralyses of the extremities appear, while gastric pains occur only seldom and transiently."

To this description we must add Burkart's painful pressure points.* The patients feel, on deep pressure in the retroperitoneum, in the region of the superior hypogastric plexus, and of the aortic and cœliac plexuses, extremely violent and very disagreeable pains, which radiate upwards towards the stomach. Burkart says that these pressure points are found regularly. At the third congress for internal medicine I stated in my review of nervous dyspepsia † that in my experience this is by no means always the case. Richter ‡ also says that pressure in the stomach and hypochondrium is usually not painful, and since then this reservation has been confirmed by others. At that time, too, I could say the same of the painful points in the dorsal spine upon which Rosenthal lays so much stress. They may be present, as Rosenthal says, in about 75 per cent. of all cases, and are of importance in the description of the disease, but they are not a necessary attribute of it. On the contrary, further experience has shown me how frequently the spinal pain is absent on pressure and on electrical brushing, in cases of undoubted neurasthenia. I will relate a case of my own side by side with one of Rosenthal's. A man of thirty-two, records Rosenthal, states that three years ago after a night of pleasure he caught cold going home. Soon after a pain of steadily increasing intensity appeared in the stomach region. The pain was described as burning and boring, often going through from the hypochondrium to the epigastrium, eliciting from the writhing patient loud groans and cries. His face was as pale as death, and covered with clammy sweat, his hands and feet were cold, his pulse was small and hard. The attack, which did not yield till the evening, lasted for hours, and when it left him the patient fell asleep exhausted. Severe attacks alternated often with weaker ones; neither the quality nor the quantity of food appeared to influence them. The affection, which was sometimes regarded as an ulcer, at others as hepatic colic, resisted all current treatment; long continued daily washing of the stomach and methodical drinking of Carlsbad water produced no marked improvement. The gastroscopic examination of the stomach undertaken by Dr. Mikulicz showed no kind of alteration in its wall. The stomach contents gave a mean amount of acidity and digestive capacity. The normal dimensions of the liver, the absence of any tenderness, icteric colouring of the skin or urine, as well as rise of temperature excluded hepatic colic. The alleviation of the pain by deep pressure on the stomach during the attacks, the spontaneous typical occurrence of the pain, which was never induced by food (even the most indigestible), as well as the entire absence of digestive pain or vomiting, precluded the diagnosis of ulcer. Renal calculus, pancreatic diseases, &c., which sometimes give rise to cardialgia, could not be admitted. On the other hand, the painful points in the spine, the hyperalgesia of the intercostal nerves round to the epigastrium, the diffusely occurring muscular spasms in different parts of the body, the exaggerated tendon reflexes, the yellowish white complexion of the patient, as well as his mental irritability, pronounced in favour of a neurasthenic basis for the gastric neuralgia.

---

* R. Burkart. Zur Pathologie der Neurasthenia gastrica. Bonn, 1882.

† Ewald. Verhandlungen des Congresses für innere Medicin, 1884, p. 232.

‡ Richter. Ueber nervöse Dyspepsie und nervöse Enteropathie. Berl. klin. Woch. 1882, No. 13.

This change in the diagnosis demanded a reversion of the treatment. Abstaining from all local measures, the patient was ordered nutritious diet and a certain amount of beer; the abnormally increased irritability of his nerve centres was antagonised by moderately large doses of bromide of potassium (3—4 grms., with 1 grm. sod. bicarb.) morning and evening. With his dinner he took as much ferri pyrophosph. c. sod. citr. as would go on the point of a knife, with a view to counteract the anæmia. In the course of the next two days he had some slight reminders of his stomach pain, after which they left him; the use of the powders was still persisted in for fourteen days. During the following six weeks' observation there was not the least disturbance of his well-being.

My case (not the only one of this kind which I have observed) is shortly as follows: A merchant, aged forty-five, was brought to me in August, 1885, by his family physician. His complaints consisted in great languor, heaviness in the legs, dislike to work, and confused head, especially after eating. His appetite was variable, and he could by no means eat so often as previously. He had suffered for about six weeks from very painful gastralgic attacks, which occurred at first at long intervals, latterly daily, and even many times in a day. Although not setting in immediately after a meal, the patient attributed them to eating, and he had consequently reduced his diet and had lost ten pounds in weight. A three weeks' cure at Carlsbad had been useless; indeed, the patient was worse. Bowels confined. The patient was a very vigorous man, well nourished, but pale. He is the owner of a large factory, which is combined with an export and import business; he employs over a hundred people in part out of Berlin, and he has to make frequent journeys, and consequently has many annoyances and irritations. On account of the illness of his partner he had been obliged to bear the entire burden of his business for a long time. A similar attack occurred a year ago.

Objective examination discovered no abnormality. The absence of spinal or intercostal neuralgia or puncta dolorosa was specially noted. The tendon reflexes were, on the other hand, exaggerated. The chemical functions of the stomach (as ascertained by the test-breakfast) were normal. There could be no doubt that this was a case of purely nervous gastralgia in spite of the complete absence of such a characteristic symptom as the puncta dolorosa. Treatment confirmed the diagnosis. Commencing with the use of bromide of potassium, a stay of some weeks on the Baltic cut short the gastralgic attacks, and allowed the patient rapidly to regain his weight. The improvement in his diet and a hygienic regimen (daily baths, rides) did the rest. The patient has remained since free from attacks.

I cannot forbear to point out how difficult it is in such a case as that of Rosenthal to exclude biliary colic. I am not quite sure about it in this case. There are, undoubtedly, cases of biliary colic in which there are neither icterus, nor tumour of the gall bladder, nor febrile movement, and in which the diagnosis between the liver and the stomach is in an undeterminable state. Among my ten cases of pure gastralgia I have four against which I have placed a note of interrogation: The following may serve as an example: A lady of thirty, well nourished, the mother of seven children, never had pains in the stomach till five years ago, after the last child but one. She had biliary colic, for which she went to Carlsbad with benefit; but during the last year she had had painful cramps in the stomach, at first seldom, but lately every fortnight. The uterus was stated by a specialist to be normal. No heaving or vomiting, appetite good between the attacks. Bowels confined after the attacks, otherwise regular. Regulation of the diet, the use of Marienbad Kreuzbrunnen water and soda, with the addition of a little morphia, were followed by decided benefit, but in the course of the two months in which she was under observation slight attacks recurred from time to time. Although the patient localised the pain, which earlier she had referred to the right hypochondrium, in the middle line or to the left of it, the diagnosis must remain in suspense, if we reflect that as a sequela to biliary colic, inflammation of the gall bladder and neighbouring tissues, with cicatricial formation, may occur, the stretching of which tissue would give rise to colic-like pains.

Hysterical gastralgia.—It is only on account of the presence of hysteria that we can recognise the gastralgias which occur in its course as hysterical.

The following remarks, while not exhausting the protean picture of hysteria, still give us some landmarks upon which I lay the less stress as the characteristic presence of hysteria is not easily mistaken. In opposition to neurasthenia, in hysteria there are psychical factors, perversity of thinking and feeling in the first place. The tendency to devise extraordinary schemes, convulsions with or without loss of consciousness, but always happening in one way, the distaste for every useful kind of work, the self-immersion in her own fancifully constructed disease round which revolves the entire *ego* of the patient, the capricious voluntary and irregular sensations outside the lines of ordinary feelings, constitute an aberration of normal thinking and feeling and a deep disorder of mental life. Accompanying these are the most manifold and demonstrable nerve disorders, spasms and paralyses, differences in the pupils, hemianæsthesia, stigmata, disturbances of electro-sensibility. The phenomena of transference offer further symptoms. I have been especially struck with the absence or diminution of electro-sensibility over the abdomen combined with the gastric pains, which is to be observed when scarcely any other evidence of hysteria is present. A good example is to be found in the following case, the history of which I present in the words of the colleague who sent her to me: The patient, a woman of fifty-two, had a long history of illness. Apparently it began with hæmorrhoidal troubles soon after her marriage, but she complained chiefly of constipation. She suffered for years from chronic metritis and endometritis; catamenia very profuse, of long duration (8 days), accompanied by many menstrual molimina. Irrigations, sitz-baths, local applications to the cervical canal, and purgatives caused temporary improvement. As the local and medicinal treatment here did no good, the patient went to Elster. The consequence was an abatement of the profuse hæmorrhages, but frequent digestive disorders, combined with lumbar pains, and pains in the inguinal and umbilical regions, still showed themselves. Against these inexorable complaints, reinforced by the symptoms of stoppage occurring now here now there in the portal area, the patient was sent that year to Kissingen. Here for the first time she felt pains and pricking in her chest, which ordinarily occurred after midnight and only at night, with great violence and suddenness, and ended, after lasting about an hour, with loud eructations. Sometimes she had these attacks on a number of consecutive nights, and then would be for several nights free. The patient gave one the impression of being an easily excited lady, but was otherwise well preserved for her age, although she was thin, and she had on the back of the left hand and forearm a completely anæsthetic zone; the knee-jerks were absent, the abdominal walls were sensitive to the slightest touch, whilst faradic brushing, which was very painful over the face, arms, and legs, was scarcely felt over the abdomen. There could be no doubt that this was a hysterical condition, with reflex dyspepsia depending on uterine disease as the prominent symptom.

It is very characteristic of hysterical gastralgia that it alternates with neuralgia or neuroses of other organs. A splendid case of this kind related by Oser, in which hysterical aphonia alternated with gastralgia, suggests that there may have been an implication of the vagus nucleus. I observed about a year and a half ago in my sanatorium a case in which after persistent constipation—spontaneous motions never occurred—the well-known sensations came on in the belly, so that the patient soon believed she had a frog in her stomach, then that she had swallowed a pin, next that she felt a tumour, and at times she had attacks of hysterical hoarseness and aphonia. From time to time actual gastralgic attacks occurred.

A typical case of hysterical gastralgia seen by me not long ago is too characteristic not to be repeated, and it appears noteworthy on account of the treatment employed.

On April 1st, 1889, I was summoned to a consultation in a distant suburb with the remark that the family attendant would be informed. When I got there I found the latter not present, but I heard that he had refused to come, remarking that "there was nothing to be done yet." I found a slender, small, badly-developed person of thirty, who lived with her mother in relatively poor circumstances. For eight months she had lain in bed apparently because she was too weak to walk. She took little and only soft nutriment, but in spite of this was tortured by severe attacks of gastralgia, which amounted to such violent paroxysms that, as her mother said, she scratched the lime from the wall and set the house in an uproar with her screams. In her youth she had had chorea. Objective ovarian pain, pain on pressure in the pit of the stomach, no anæsthesia, knee-jerks present, tongue clean, no fœtor, no vomiting, stools obstinately constipated and like sheep's dung. The diagnosis appeared without doubt to be a hysterical affection. I got the patient out of bed and made her walk across the room, holding her under the arms in order to show her that she could walk. As I convinced myself by this that there was no organic disease, I ordered that she should come to my house next morning. The day after I was disturbed during my consulting hours by a loud noise. It was the patient, who had come all the way, three quarters of an hour's drive, to my house in a cab, and had been carried up stairs by the driver, and was supported into the room by two persons. In order to examine the chemistry of the stomach, to diminish its hyperæsthesia and make a moral impression, I washed out her stomach, during which operation she became very cyanosed. In the washings there was no free hydrochloric acid. She was ordered hydrochloric acid, tinct. belladonnæ, and cocaine. Six days later she appeared again; she was alone, and had come upstairs by herself, though very slowly and with much trouble, but she had now a splendid hysterical bell-cough. She was washed out again. No hydrochloric acid. A little peptone. After three days she came upstairs alone; the cough had gone, the pains were occasional but slight. The appetite was re-established. The stomach was washed out twice after this at intervals of several days. On May 31st I noted: speaks quite well, walks without support, only holding lightly by the hand, complains still of nausea, pains in the belly after eating and running, weight in the legs. Two and a half hours after the test breakfast the stomach was quite empty. She took arsenic with iron, and was sent to the country. In the autumn her mother told me that she had kept quite well except for slight pains.

I do not regard these cases as uncommon. Similar cases, perhaps not so surprisingly curable, occur every day. But it is a characteristic example, and was very apposite, because among the audience at my course of lectures, when I introduced the patient, was a colleague who had attended her for a long time without doing any good.

It is not worth while to say more on this subject. Each one of you has sufficiently frequent opportunities of observing hysterical conditions in your own practice. The gastralgia is only a link in the chain of multiform phenomena; it is necessary to be careful not to be deceived as to the real nature of the attacks in such cases, but to recognise their hysterical basis. Though this is easy in many, or indeed in most, cases, it may be very difficult where hysteria is only expressed by one symptom, for example, only by the gastralgic attacks, and when it occurs not in young but in elderly people, or even in males.

Finally, there are the *gastralgias in mental diseases*, occurring in their premonitory stages, which gives them a special value. A year and a half ago I treated a young engineer for gastralgia based on neurasthenia. He became melancholic, and committed suicide. There was a family history of insanity. A brother had died in a lunatic asylum.

The above-named patient with bulimia came again under my treatment two years later. He had attempted suicide by swallowing large doses of morphine. He then presented signs of mental disturbance, and died some months later in an asylum for mental disorders of softening of the brain.

LECTURE XI.

ON THE NEUROSES OF THE STOMACH.

GENTLEMEN,—I regard hyperacidity or hypersecretion of the gastric juice as a sensory neurosis in the sphere of secretion. Reichmann has done good service in carefully investigating this condition by modern methods, but it is an error to believe that it was not known previously. It was described more than half a century ago by Pemberton, Copland, Todd, Budd, Trousseau, and among the Germans by Hübner,[*] but afterwards it was forgotten because they rather guessed than based their descriptions on direct observation. Recently the subject has been worked at by Jaworski, von den Velden, Riegel, Saly, von Noorden, and Honigmann. Hyperacidity is an increase of the normal secretion of hydrochloric acid and follows the stimulus of ingesta, after swallowing which increased acidity takes place. Certainly it is hard to say where the normal acidity ceases and the excess begins, as it must be understood that there is no sharply defined limit like the zero of a thermometer, but that there is always an intermediate quantity dependent on individual conditions, which must be very doubtful whether it should be described as hyperacidity or not. Still the average of numerous observations with the test breakfast fixes the commencement of hyperacidity between sixty and seventy.

---

[*] Thus Pemberton in 1829 says (Treatise of the various diseases of the abdominal viscera), "A morbidly increased secretion from the stomach analogous to a diabetic secretion from the kidneys;" and Copland, "or in other words that pyrosis is produced by the continuance of the secretion of the gastric juices after the food taken into the stomach has passed into the duodenum;" and Budd says that pains, &c., arise "from the presence of free acid in the empty stomach." Trousseau (Des dyspepsies, l'Union méd. 1857, p. 306); "Le névralgie de l'estomac augmente les secretions acides à ce point qu'elles se feront non plus comme d'habitude au moment de la digestion mais encore en dehors de ces moments;" by Hübner (Die gastrischen Krankheiten monographisch dargestellt. Leipzig, 1844, p. 209), "A morbidly altered secretion of the gastric juice . . . is the cause of the acidity from which the patient suffers unintermittingly; he may eat what he likes; the symptoms are more marked, and because the cause persists, more constant, than the acid formation in fermentation."

The relations of hyperacidity to ulcer of the stomach have been already described, but independently of organic disease, there is undoubtedly a true primary neurosis of this kind. It has been observed by von Noorden[*] in melancholia; Jolly describes an increase of the gastric secretion in hysteria, and Jaworski[†] has observed the frequent occurrence of hyperacidity among the Jewish population of Galicia, who are greatly predisposed to nervous disorders. It occurs transiently as a reflex phenomenon after hepatic and renal colic, but even where these causes are absent the nervous basis of the disorder may be recognised by the failure of treatment directed to a gastric ulcer. Last summer I treated a young lady of nineteen for nearly three months for gastric ulcer, because she had periodical gastralgia and hyperacidity of 88. The absolute failure of the treatment, and the steady recurrence of the attacks, with improvement of the general health and increase of weight, pronounced in favour of the purely nervous basis of the disease, although there were no other symptoms of hysteria or neurasthenia.

Hypersecretion, or rather parasecretion, the "flow of gastric juice" of Reichmann, is divided into a *periodic* and a *continuous* form. The first occurs as a rule without increased acidity, the other is generally combined with it. The *periodic* form occurs mostly after meals, seldom during fasting, but does not appear to be directly connected with the entrance of food into the stomach. A typical case of this kind is recorded by Wilkens:[‡] Case of hypersecretion of the gastric juice in intermittent attacks. A musician aged thirty-six. Wandering life. For three and a half years attacks of vomiting and pain in the stomach, inability during the attacks to eat or drink. Similar attacks at intervals of ten or twelve days, lasting from twenty-seven to thirty-five hours. during which he was obliged to stay in bed. Loss of weight of from four to seven pounds. Great hunger in the intervals. The vomited gastric juice, about two and a half pounds, contained each time 0·12 per cent. of hydrochloric acid.

---

[*] Sitzungsbericht der medicin. Gesellschaft im Giessen. Analysed in Berl. klin. Wochenschr. No. 18, 1887.

[†] W. Jaworski. Zusammenhang zwischen subjectiven Magensymptomen und objectiven Befunden bei Magenfunctionsstörungen. Wiener med. Wochenschr. 1886, No. 49—52.

[‡] S. A. Wilkens. A case of hypersecretion in intermittent attacks. Lancet, 27th Aug., 1887.

Affection of the secreting nerves.

All authors are united in regarding this condition as a functional disturbance of the nerves of the stomach, occurring independently or as a part of other neuroses. The *continuous flow of gastric juice*, chronic hypersecretion, consists in a permanent secretion of, for the most part, excessively acid gastric juice,* so that we find even in fasting stomachs more or less large quantities, varying from 100 to 1,000 cc. and more, of a fluid very like ordinary gastric juice which contains no remains of food, but is frequently coloured grass-green or bluish-green from admixture of bile.† Its degree of acidity is increased, but the amount of free hydrochloric acid, according to Jaworski, varies very much, as with equal degrees of acidity there may be in one case much free hydrochloric acid with a feeble biuret reaction, and in another case little free hydrochloric acid with a strong biuret reaction in spite of the absence of organic acids, and finally there are rare cases in which the degree of acidity is so high that we expect a positive reaction with colouring matters, yet no result is obtained. Jaworski attributes this to the admixture of desquamated elements of the mucous membrane, or wandered leucocytes, or blood-serum, which by the formation of peptone and of acid combinations arrests the free hydrochloric acid, wholly or in part, as I have already (p. 240) explained, and is the general rule with albuminous bodies, as v. Pfungen has proved.

Starch digestion is prolonged after eating, but albumen digestion is strongly developed, so that after a meal of meat and starchy food we find plenty of remains of starch but none of meat (Riegel). In the place of the ordinary varieties of epithelium, the fasting stomach contains sharply contoured nuclei, which with Trinkler, who first observed them in animals,‡ and Jaworski I regard as the remains of undigested cells. This condition of chronic hypersecretion is quite the rule, according to Jaworski, who found out of 159 cases, 115 with continuous excessively acid secretion; Riegel does not go so far, but thinks it is the case in about half the subjects of stomach disorders. This does not agree with my observations. Strictly speaking, I am not very competent on this question, because I have only examined patients when fasting, whose complaints—pains, heartburn, eructation, &c., occurring during the night or the morning fast—induced me to examine their empty stomachs, but under these conditions I have not found hypersecretion to be common. Even if I include, as Riegel does, the cases of dilatation, so as to have about 600 patients, apart from hospital investigations, whom I have examined during the last few years, I can only muster fifteen, ten males and five females, showing an excess of males according to other writers. Whether the hypersecretion is, as v. d. Velden thinks, only a very prolonged reaction to the stimulus of food, or whether, as Reichmann, Riegel, and I assume, it takes place continuously, may remain undecided.

---

* Out of 121 cases of hypersecretion, Jaworski (l.c.) found 115 with hyperacidity also.

† In 222 cases, 77 times. Jaworski, l.c.

‡ Trinkler. Ueber den Bau der Magenschleimhaut. M. Schultze's Archiv. Bd. xxiv. p. 195.

The irritation exerted on the mucosa by the acid fluid leads to hyperæsthesia, with resulting tenderness or pains in the epigastrium, acid risings, heartburn, acid vomitings, gastralgia, and digestive troubles, having the appearance of the symptoms of a chronic inflammatory condition. The stomach in neurasthenia, under certain circumstances, appears to react abnormally to acids, as Talma * had observed. Still, the tongue is generally clean, and the appetite is not only not diminished but increased. Excessive thirst, which was frequent in Jaworski's cases, may be allayed by drinking water (which is not wonderful!), as a result of the stomach contents being diluted. In consequence of this condition atony of the muscular coat and dilatation of the stomach may occur; this is so common in cases of long standing, that out of thirty cases in Riegel's wards,† in twenty-nine there was more or less distinct dilatation. However, under such circumstances, an organic disease has grown out of the neuroses, and this condition must be included under dilatation of the stomach, and not among its neuroses.

The diagnosis of this condition can be made with exactitude only by examining the stomach contents, and, so far as the question of hypersecretion is concerned, only by examining the contents of the fasting stomach. We get some insight into it from the circumstance that the disturbance after albuminous

---

* **S. Talma.** Zur Behandlung von Magenkrankheiten. Zeitschr. f. klin. Med. Bd. 8, p. 407.

† **Honigmann**, l.c.

food disappears rapidly, and thereby a distinguishing mark is afforded between this and the pain of pyrosis or gastralgia in consequence of acid fermentations. These conditions, the nervous and the fermentative hyperacidity, are both equally benefited for a time by alkalies, but the distinction is that the former is not improved any more by direct treatment than by these symptomatic means, while the latter is overcome and removed by specific measures.

I would reckon among this group of neuroses the condition described by Rossbach under the name of gastroxynsis, which is only distinguished from migraine by the attacks being not so frequently spontaneous, but more the result of occasioning causes which give rise to mental strain or strong emotions, and that the vomited matters are very acid, as much as 3·4 and 4 per mille of hydrochloric acid having been found. The latter condition is common to this disease and to migraine, as I have repeatedly met with equally high figures in migrainous vomit. Jürgensen also has observed very similar conditions.*

Nervous risings and eructations occur alone, in my experience, in hysterical persons only, whilst in neurasthenia they are always combined with other sensations, especially feelings of weight and tension in the region of the stomach.

I agree with Weissgerber, who has published a very complete treatise on eructation, † that in the first instance it is caused by increased contraction of the stomach with strong tonic spasm of the pylorus, it being granted that these hysterical phenomena belong to the class of irritative processes. As the pylorus has a stronger muscular ring than the cardia, it contracts more strongly to an equal stimulus, and gases are more easily expelled upwards than downwards, when the tension of the stomach wall becomes too great, and the organ seeks to disembarrass itself of its gaseous contents. That eructation is not purely passive, but is an active process, cannot be doubted. It may be, as Stiller and Rosenthal think, that relaxation of the cardia facilitates the escape of gases, so that, according to circumstances, eructation may be regarded as the consequence of either the increased or the paralysed muscular action of the stomach. Still, it is certain that in many cases eructation has nothing to do with relaxation of the cardia, as is proved by the cases of numerous patients who have stomachs filled with gas, and torture themselves extremely in getting rid of it.

---

* Jürgensen. Ueber Abschiedung neuer Formen nervöser Magenkrankheiten. Deutsches Arch. f. klin. Med. Bd. 43, pp. 9—20.

† Weissgerber. Ueber den Mechanismus der Ructus und Bemerkungen über den Lufteintritt in den Magen Neugeborener. Berl. klin. Wochenschr. 1878, No. 35.

But there is a kind of eructation in which the stomach comes scarcely at all into play, but where only air is brought up from the œsophagus by contraction of the cervical muscles, just as Bristowe thinks is the case in hysterical vomiting.* This form has escaped the notice of Weissgerber. I am myself able to eructate voluntarily, and by the aid of the swallowing murmur I have observed that air driven into the œsophagus does not quite reach the stomach, but goes through the cardia when the next true act of swallowing takes place. It is possible to eructate from the œsophagus only, and no doubt in many cases of hysterical eructation, where the stomach is not distended, this is the case.

Eructation may become a very disagreeable and tormenting symptom, as it is never noiseless, and is generally quite loud. Cartellieri has counted it as having occurred about 2,500 times in an attack lasting one hour.† The gases are always without smell or taste, and are thereby distinguished from those brought up in genuine dyspepsia, fermentative processes, &c. They consist of atmospheric air, which is generally thought to have been swallowed, but perhaps comes from the bowel, though in many cases it is certainly derived from the œsophagus. Cartellieri says that his patient had no time to swallow air during the attacks, but in that case was air actually eructated, or was it only a simulation of the eructation of air? This point has, so far as I know, never been examined.

By *pyrosis* we mean the rising of acid matter from the stomach, a phenomenon generally known under the name of heartburn. So far as the nervous form is concerned, it has nothing to do with excess of acid in the stomach contents, but the normal gastric juice or contents can give rise to great acidity and burning when they come up. It is permissible to doubt whether the cause should be sought in increased contraction of the muscular wall of the stomach or in paralysis of the sphinctor cardiæ. The circumstance that I have sought in vain for the sign of relaxation of the cardia, namely, the presence of the first deglutition sound, has disposed me to attribute the affection to irritative conditions of the motor sphere.

---

* Bristowe. "Clinical Remarks on the Functional Vomiting of Hysteria." Practitioner, 1883, p. 161.

† P. Cartellieri. Eine selten vorkommende Magenneurose. Wiener allgem. med. Ztg. 1885, p. 3.

This leads us to the condition called *pneumatosis*, or tympanites, an extremely disagreeable symptom. The stomach becomes filled with gas, is greatly distended, and feels not only unpleasantly full, but may give rise to severe nervous symptoms by pressure on the abdominal organs, by pushing up the diaphragm and compressing the heart. The patients get typical asthmatic attacks—the *asthma dyspepticum* of Henoch—in which at first they have only the tormenting sensation that after short pauses of normal breathing they must make deep inspirations, after which they rest again, but this condition increases latterly to incessant air-hunger. To this are added palpitation of the heart, pulsation of the peripheral arteries, confusion of the head amounting at times to complete loss of consciousness or severe feelings of faintness, in short, a general condition of so severe a kind that such patients have repeatedly assured me that they are ready to destroy themselves. The rising of flatus brings relief, and the violent attack rapidly disappears. Probably this condition is caused by air swallowed, combined with spasm of the pylorus. The chemistry of the stomach was in one such case quite normal; still the same condition may be produced by dyspeptic or fermentative gases. The symptoms may be momentarily cut short by introducing a stomach tube, through which the gases escape. The disease appears, when it has a nervous basis, to be very difficult to cure. I have made a case of pneumatosis take two grms. of cocaine in 20·0 aq. amyg. amar., ten drops every two hours, without any result, after large doses of bromide of potassium had also been taken without effect; in another the subcutaneous injection of morphia in the region of the stomach was promptly effectual; a third was cured by change of climate. A gentleman who had suffered from the severest form of pneumatosis in Brazil (a native of Brazil) was completely free from his disease in this country.

Nervous vomiting (*vomitus nervosus*).—We understand by this those forms of vomiting which have not their origin in the direct irritation of the quantity or quality of the food, or in anatomical lesions of the stomach. They are all eminently reflex, whether this means that the vomiting centre is stimulated directly or mediately from other parts of the central nervous system or from other organs. So far as we know the cause of this condition, and can make answerable for it palpable changes in the brain and spinal cord, or in the kidneys, the uterus, the liver, and certain sense organs, these forms of nervous vomiting may be summarised under the reflex neuroses.

I had occasion to observe almost simultaneously two cases of this kind of nervous vomiting, which resembled each other very closely in the greater part of their course, but ended very differently in accordance with the nature of the fundamental affection. The first case was that of a lady, aged thirty-six, who, after what was apparently catarrhal jaundice, from which, at the time I saw her, there was still a little tinge visible in the sclerotics, developed constant vomiting, with persistent salivation, and marked *fœtor ex ore*, on account of which she had been in bed three weeks. Although during this time she had taken scarcely any nourishment, because she at once vomited all she ate, yet she was very little wasted. There were nowhere any objective signs of an abnormal kind to be discovered, not even in the liver. The stools were light yellow, and loose. Only transient benefit was derived from either subcutaneous injections of morphia and atropine, washing out the stomach with chloroform water, or chloroform employed internally. Finally, the attacks were controlled by completely withholding all food and drink *per os*, and feeding her by nutritive enemata several times daily. But the salivation persisted for weeks, till finally a complete cure resulted. Perhaps this was a case of reflex irritation due to a gallstone, as there was no ground for regarding this hitherto healthy woman, the mother of many children, some of whom were quite grown up, as a subject of hysteria. However, I cannot deny that she was a source of considerable anxiety for some time on account of the absence of anything definite.

The second case, which unfortunately I had only an opportunity of seeing once, was that of a lady of fifty, living outside Berlin. At the beginning of the year 1888 she had great troubles, and in the course of the following summer she suffered from slight gastric pains, which continued in varying intensity until the middle of November. At that time vomiting occurred regularly after each meal, and this lasted with short intervals until the beginning of January 1889, when I saw her. Originally a strong woman she was much wasted, she had frequent attacks of faintness, and complained of great weakness, especially in the legs. Sleep good. Urine examined repeatedly, and found to be free from albumen and sugar. I found a bed-ridden lady, who in spite of her wasting was sufficiently strong; she moved herself relatively actively in bed, spoke with energy, in short, she seemed less ill than would be expected from the history.

With the exception of a goitre, and a pulse going up to 120, there was nothing abnormal to be discovered. No tumour in the abdomen, no tenderness. Knee-jerks present. Pupils reacted well, no contraction of the field of vision, no complaint of visual disturbance. Sensibility good throughout. Heart sounds pure. Heart dulness normal. Lungs free.

The patient ate in my presence two rolls (Zwiebach) and drank a glass of water without vomiting. Twenty-five minutes later the contents were expressed through the tube, which could be introduced with ease. No hydrochloric acid. The bits of bread were scarcely digested. After this examination the diagnosis hesitated between a severe neurosis and latent carcinoma, but the absence of any cancerous cachexia seemed to speak in favour of the former. The rapidity of the pulse was attributed to the goitre, and tabes with gastric crises was excluded by the absence of all its specific symptoms.

By feeding her with nutrient enemata, and as completely as possible abstaining from taking any food *per os*, with the use of digitalis and atropine in small doses, her condition appeared to improve at first, but afterwards relapsed into the old state. The patient became gradually weaker, epileptic convulsions set in, and in a few days she died comatose. No autopsy was made, but the entire course of the disease compels us to regard it as one of localised mischief in the medulla oblongata, probably a tumour, which involved the roots of the vagus, and gave rise to the persistent vomiting and rapid pulse. Such a position of the tumour is assumed by this hypothesis as would paralyse or destroy the heart vagus at its nucleus, while the fibres to the stomach would be set into a condition of chronic irritation. The validity of this assumption, which is not without analogy however, (Rosenthal), must remain an open question. At any rate we have in these two typical cases examples of severe vomiting, caused by nerve irritation, which show at the same time how difficult, or even impossible it may be to make a correct diagnosis at a given time during life.

But for a certain group we are not in a position to prove, although we may conjecture their reflex nature. To this belongs, in the first place, the vomiting of neurasthenia and hysteria, which occurs seldom in the former disease, but frequently in the latter.

It is characteristic that this form of vomiting generally occurs without any proper nausea, and retching is reduced to a minimum. Hysterical vomiting follows sometimes regularly after each meal, sometimes not so frequently. In many cases all food is vomited, in others only certain kinds, or even only certain definite articles. I have investigated the course of normal digestion in a hysterical patient who retained all solid food, but vomited so soon as she drank any fluid. Another young person, who has been five years in the sanatorium, vomits the greater part of her food immediately after eating it. Nutrition under these circumstances suffers surprisingly little; for example, the last patient has remained for the last four years nearly at the same weight, having gone down only from 81 lbs. to 79 lbs. In other cases the position of the body appears to influence the vomiting. Tuckwell [*] relates three cases in children, who, after vomiting for months, were reduced to a state of extreme emaciation, but in whom the vomiting stopped when the little patients were made to stand up so soon as vomiting occurred (at the same time careful supervision was maintained over their meals). Barras [†] records the case of a lady suffering from nervous vomiting who never vomited in her bath, and was cured by being fed in this position. The condition may run an acute or chronic course, may come on spontaneously or follow some demonstrable emotion. A young girl became ill directly after the death of her father, another in consequence of a broken-off engagement. The female sex is chiefly affected by these neuroses.

I must, however, remark that my experience of the infrequent vomiting in neurasthenia does not agree with that of Rosenthal, who appears to have observed it not uncommonly. I shall content myself with giving the headings of two of his cases:—

---

[*] Tuckwell, On vomiting of habit. Brit. Med. Journal, 1873, 22nd March.

[†] Barras. Traité sur les gastralgies et entéralgies. Paris, 1827.

Observation 31: Neurasthenia, hyperæsthesia to acids with consecutive gastric cramp and vomiting. Cured by local remedies (ice pills, with two to three drops of tinct. nuc. vom.) and general strengthening treatment.

Observation 32: Neurasthenia, in consequence of onanism, with frequent vomiting. After this practice was discontinued the vomiting occurred at every coitus, whilst an abundant meal never produced pain. Cure of the neurasthenia and vomiting (by sexual continence, increasing doses of bromide of potassium with some pyrophosphate of iron and citrate of soda, "Neptune's girdle," galvanisation of the sympathetic, hydropathic means).

This difference in our observations would appear surprising if it were not easily explained by the fact that two observers, at some distance apart, have to do with quite a different set of people for patients. So far as regards the multiplicity and intensity of neuroses, the easily excitable Southerner, especially those nationalities occupying the so-called military frontier, is obviously especially liable to be affected. Even hypersecretion seems to occur among them much more commonly than with us.

Finally, we have still another form of nervous vomiting to consider, which has been described by W. Leyden.* It may occur as a primary neurosis, or as a secondary spinal affection, or as a reflex form. Its periodicity is characteristic of the attack, which may last from some hours to many (ten) days. It sets in with sudden nausea and spasmodic contraction of the bowels with relaxed abdominal walls. The vomiting brings up first remains of food and mucus, then bile and streaks of blood; migraine-like headaches and pains in the limbs accompany the attack; obstinate constipation follows, caused by spasm of the bowels. The affection may last for years, and its causes can only be conjectured to be of this kind. In two of my cases the autopsies gave negative results, but in most cases this nervous vomiting belongs to the so-called "crises gastriques" complicating tabes dorsalis, which will be mentioned at the end of this chapter.

Cramp in the stomach is generally confounded with gastralgia; in fact, they are often associated, as the cramp is often associated with severe pain. But it is, as the name implies, spasmodic pain, caused by the spasmodic contraction of the stomach, and not a sensation of boring or piercing, such as is characteristic of pure gastralgia. The causal factors are the same as we have discussed at length for gastralgia.

---

* Leyden. Ueber periodisches Erbrechen (gastrische Krisen) nebst Bemerkungen über nervöse Magenaffectionen. Zeitschr. f. klin. Med. iv. p. 605, 1882.

Partial cramp of the stomach may occur at the cardia or the pylorus. Sometimes on introducing the sound it feels as if the instrument were held fast in the region of the cardia. Whether this is a contraction of the lowest section of the œsophagus or of the cardia can scarcely be decided.

Pyloric spasm may be caused, apart from the irritation of local changes, by very acid or inopportunely secreted gastric juice. It indicates the presence of hyperacidity and hypersecretion, as Boas and I have pointed out.

In distension of the stomach by gas its escape can only be prevented by abnormally tight closure of the stomach apertures.

Peristaltic restlessness (*tormina ventriculi nervosa*).—This condition, which was first described by Kussmaul,* consists in increased peristalsis, which is so violent and in such large waves that it can be distinctly seen through the relaxed abdominal walls, and is accompanied by loudly audible rumblings and noises in the belly. While not in itself painful, it may torment the patient very greatly. "It feels to me as if the bowels turned round inside my body," said, briefly, to me a lady aged forty-six, in whom the explosions in the bowels were audible as soon as she entered the room. They are strongest after meals, but do not disappear completely during fasting, and have, like other neuroses, the characteristic peculiarity that sometimes they cease when the patient is a little excited, for example, by the doctor's visit, although just before they had been present in all their violence. As Kussmaul first described it, this condition is most commonly met with in the subjects of dilated stomachs. The reverse of this condition, *antiperistaltic restlessness*, is regarded as a pure neurosis, for though the earlier published cases of Schütz and Cahn are open to objection, a typical example has been observed by Glax.† This was the case of a gentleman, aged thirty-two, with a history of dyspeptic pains and slight dilatation of the stomach, whose condition Glax describes as follows: "There appeared in a vertical direction downwards from the right sternal border to the stomach a slight but distinct retraction; suddenly to the left of this the fundus ventriculi projected hard and tense, gradually expanding to the size of a child's head, and as gradually this prominence sank down to appear on the right of the retraction, then in the same manner it passed again to the left. But many times the movements passed distinctly from right to left in the antiperistaltic direction. I then distended the stomach with carbonic acid gas, which made the movements extraordinarily lively."

---

* Kussmaul. Volkmann's Samml. klin. Vorträge. p. 181, 1880.

† Glax, l.c. p. 190.

It may be a cause of confusion that peristaltic restlessness of the bowel not infrequently occurs, which may also become antiperistaltic, and, as the cases of Briquet, Jaccoud and Fouquet, and Rosenstein show, may cause discharge of formed fæces and coloured enemata by the mouth.

In many patients we can set up distinct peristaltic movements by scratching them quickly and sharply in the region of the stomach.

II.—DEPRESSIVE CONDITIONS.

We know very little about anæsthetic states of the stomach; indeed, we may more correctly say that we know nothing. In the lecture on innervation these conditions have been discussed, and as we have normally no perception of the processes which go on in our stomachs, we shall naturally hardly look for a pathological want of sensation.

Standing in close relation to anæsthesia, and, as a result of it, is *polyphagia* or *acoria*, that is, the want of any feeling of satiety.

If in the discussion of bulimia and anorexia we have made it probable that these originate in over-excitation of the central parts of the brain, we must also regard the condition of satiety as the inhibition of hunger; the absence of satiety indicates either that the hunger centre has withdrawn its influence from the nerves involved, or that the latter have become defective. I have already remarked on the vagueness and uncertainty of such deductions, for which we have at present no proper data, and with these remarks we shall leave the subject.

Purely nervous polyphagia is a rare occurrence; naturally, I do not speak of those gluttons who are full of the old and new books on gastrosophy, but of an actual pathological condition, which develops generally in the absence of any material lesion, and so finds its place there.

Nervous anacidity of the gastric juice is not so uncommon as might seem after a perusal of its literature. I have repeatedly observed it in hysteria (see the above-described case of hysterical gastralgia). But I have also seen it in neurasthenia, where there was no ground for suspecting any organic disease of the stomach. I must limit myself to the following case:—P., a landed proprietor from Culm, a powerful man of herculean build, forty-three years of age. He had become very nervous after the death of his wife. He imagined that he had cancer of the stomach. He complained of increasing restlessness and sleeplessness of weeks standing; sensations in the urinary passages; impaired sexual power; no appetite; extremely moody temper. Bowels sluggish, motions hard and dry. Beyond a high degree of sensitiveness of the spine to pressure over the spinous processes and to faradic brushing, there was nothing to be made out objectively. In particular, the stomach and urinary apparatus (catheterism) were quite free. Examination of the test breakfast showed that there was complete absence of hydrochloric acid. He was taken into the sanatorium; he slept after bromide of potassium; he received hydrochloric acid, tepid baths in the morning, and warm rubbing at night. He was observed for nearly two months, and during that time the gastric contents, after the test breakfast, were examined five times at intervals of about eight days. The contents were always neutral, and consisted of the little altered breakfast without mucus.

His condition improved slowly, but intercurrent sensations occurred in the soles of his feet, in the loins, in the larynx, and in the urinary passages. He was recommended to the cold water establishment at Elgersburg, and he remained there many weeks. Later on the following report was sent to me from there: "The neurasthenic Herr P., who leaves to-day, has generally improved in strength by the use of tepid hip and sitz-baths, electricity and massage, but he still complains of his old troubles," &c.

Before very long I heard again from the patient. His complaints were then—eighteen months later—exactly the same. There was no question of any true loss of strength.

We can certainly exclude in this case any organic disease, such as carcinoma, mucous catarrh, &c. It is a case of anacidity from neurasthenia, of which I have met with three or four other examples.

I have already given you my opinion respecting the significance of the absence of free hydrochloric acid in the diagnosis of carcinoma.

Relaxations of the cardia and pylorus are to be mentioned as paralytic conditions.

Paresis of the cardia may give rise to tormenting and distressing nervous *eructation* (v.s. eructation). But if besides gas, fluid matter or remains of food come up, we speak of it as *regurgitation.* Many people after eating bring up little bits of their stomach contents with a sharply acid taste, which they swallow again at once, without the condition being one to describe as morbid or very disagreeable. But if regurgitation occurs repeatedly, and large quantities come up so that they cannot be swallowed again, but are spat out—proper rumination, as in animals, not taking place—the condition is very disagreeable, and may lead to serious disturbance of nutrition, yet it may exist for years without any particular harm resulting. By an effort of will it may sometimes be suppressed; still, I have seen a case of a young man, where neither the best will on the part of the patient, nor large doses of bromide of sodium had any effect whatever. Regurgitation occurs also in *diverticulum œsophagi*, either where there is a stricture below it, from the cavity becoming filled and overflowing towards the mouth, or because its contents are intentionally brought up, or rather expelled. In my course of lectures I have repeatedly shown a patient with a diverticulum who is able voluntarily to bring up the contents of his diverticulum by inspiring deeply and compressing his abdomen. As he only took fluids and no solid food, the matter brought up was free from solid elements, consisting for the most part of mucus, and permitting us to recognise by the smell whether coffee, alcohol, or such-like had been taken. The reaction was alkaline or neutral. At first there was no smell, but latterly the patient observed that the regurgitated matter smelt slightly putrid.

It is somewhat different in rumination or *merycism*, or chewing the cud, a process which captivated the imaginations of the ancients, both medical and lay, to no small degree, and has led to the most wonderful notions. Not only did they think that the ruminator was necessarily descended from horned parents *—as Fabricius says, "ex quo forte datur nobis intelligi parentis semen aliquam habuisse affinitatem cum cornigeris animalibus neque mirum fuisse genitum simile quid a parente contraxisse" (the father must have had a horn on his forehead)—they at least expected that as children they had been suckled at the udder of some ruminating animal,† or at least had had "sinful connection with a cow." That the stomach in ruminators consisted, as in animals, of many compartments, was for long thought to be settled, until dissection showed that as a rule there was no palpable alteration in it, or in the œsophagus. At least the negative results are more frequent in the recent data; for whilst Schneider relates the case of a privy councillor in Fulda, who had ruminated all his life, and died at the end of the last century, at the age of seventy, in whom the cardia was wide enough to admit five fingers, and the stomach was enormously dilated, and Arnold observed in three cases of rumination a circumscribed dilatation of the œsophagus above the cardia, so as to form an *antrum cardiacum*, Bourneville and Séglas, in their monograph on merycism, published in 1883, come to the conclusion that anatomical changes are generally not present.

The phenomena of rumination are in fact well qualified to engage our interest. It is very peculiar that the food should come back again into the mouth, at a longer or shorter interval after eating, without any alteration in taste, and in single mouthfuls, then be chewed again and swallowed for a second time, and it is still more wonderful if the food comes up again in quite definite order, tasting better than before,‡ or at least has its taste altered so little, that as Peter Frank recorded, a patient could next day distinguish the food as it came up in reverse order to that in which it had been eaten, or, as Darwin states, he could bring up at will the food which he had eaten. This borders closely on the miraculous, and finds no support in the observation of Gallois,* according to which the matter brought up consists at first of a pulp, in which solid and fluid ingesta are mixed without distinction, but in the later stages of digestion only solid, and finally only indigestible bits of food are brought up, such as tendon, salad leaves, and such-like. According to this account, the process appears to be easily explained; as the digested fluid food is removed from the stomach, the ruminated matter becomes more solid, that is, contains a larger proportion of matter which the stomach has failed to digest, until finally it consists of nothing else. The composition of the ruminated matter depends not on the will of the patient, but on the stage of digestion at which rumination occurs. Rossier † induced a ruminating patient to write down the number of mouthfuls regurgitated. The number amounted to, for breakfast from six to twelve, for dinner from eleven to twenty-one, for supper from seven to sixteen. We must not confound with rumination those conditions in which healthy persons are able to regurgitate their stomach contents at will; they obviously are able to express the contents of the stomach at will just as we do in my method of stomach expression. Montegre was induced by this circumstance to undertake his researches on digestion.‡

---

* I take these data from the essays of Bourneville and Séglas, Archives de Névrologie, 1883, p. 86; Schmidtmann, l.c. p. 183; Schneider, "Das Wiederkäuen beim Menschen," Heidelberger med. Annalen, 12, p. 251, 1846; A. Johannessen, "Ueber das Wiederkäuen beim Menschen," Zeitschr. f. klin. Medicin. Bd. 10, p. 274.

† Daniel Perinetti: A boy of eight who was suckled by a goat for two years, and afterwards ruminated from imitation!

‡ Anthony Rechy said: "Indeed it is sweeter than honey, and accompanied with a more delightful relish."

There can be no doubt that the phenomenon of rumination must be ascribed to a neurosis. In favour of this view are the well-established cases of heredity, such as, for example, Windthier's case of a Swede, aged forty-five, who ruminated for thirty years, his son of twenty-four being also affected; also the case of Rossier, in which a father and son, of sixty-five and twenty-five respectively, were ruminators; further, we have the fact that imitation plays a great part in this transmission, as in the example recorded by Korner, where a ruminating governess communicated the disease to both her pupils; and, finally, it is relatively often met with in nervous persons, neurasthenics, hysterics, epileptics, and idiots, but ceases when the patients suffer from violent emotions, anger, vexation, &c. A case related by Ducasse [*] confirms this view; it was that of a young man who had ruminated from his sixth to his twenty-eighth year, but after his marriage the habit diminished at once, and after eight days it completely disappeared, while in another case the reverse occurred, and other instances are recorded in which sexual excesses caused increase of the rumination. Whilst the condition of nutrition of the affected persons varies very much, and the disease is met with in all classes of society and at all ages, haste in eating, and bolting large pieces of food, appear to occur very frequently. Rumination may be voluntary or involuntary, but its suppression is attended by pain. Many guesses have been hazarded as to its causation, the seat of the affection being sometimes regarded as central, sometimes as peripheral; sometimes it has been attributed to relaxation of the cardia, sometimes to increased sensibility of the mucosa, with exaggerated contractions of the muscular wall of the stomach; or, finally, to a peculiar conformation of the organ or of the *antrum cardiacum* of the œsophagus. We must confess that we are quite ignorant of the proper cause of the affection, and that it is only a periphrase when we speak of it, as does Dehio,[†] as a perverse combination of motor processes or a reflex functional neurosis. The deglutition murmur proves that there is no permanent relaxation of the cardia. Dehio heard in his patient a distinct expulsive murmur, "which, according to the ordinary view of the origin of this murmur, should be absent in paralysis of the cardia." Moreover, by distending the stomach with carbonic acid gas the cardia is found to be quite competent. In two cases of certainly ill-marked rumination, better described as regurgitation, I heard a normal expulsive murmur and no injection murmur, on repeated examinations. According to the current view, this would speak against permanent relaxation of the cardia if there were no other evidence that the tonus of the muscle of the cardia must be relaxed at the moment of rumination, and paresis, or rather an unusually easy yielding of the cardia, must occur. Unfortunately, Alt omitted to test the deglutition murmurs in his patient, who was able to swallow two living gold-fish, respectively 6½ and 5⅓ cm. long, and twenty minutes later to regurgitate them alive; still, it seems impossible without relaxation of the cardia and œsophagus that these delicate fish could pass alive through such a narrow passage. The question whether permanent or temporary relaxation occurs is certainly not settled by this, but it appears to me to justify us in regarding rumination as due to insufficiency of the cardia. Both my cases occurred in pronounced neurasthenics (males), and in this respect they agreed with those already known.

---

* P. Gallois. Mérycisme et étude physiologique de la digestion stomacale. Revue de méd. 1889, No. 3.

† Rossier. Mérycisme héréditaire dépendant d'une epilepsie. Annal. de la Soc. de méd. d'Anvers, Avril—Mai, 1867.

‡ Montegre. Expériences sur la digestion. Paris, 1814.

---

[*] Ducasse. Mém. de l'acad. royale de Toulouse, Bd. III., quoted by Schneider, l.c.

[†] K. Dehio. Ein Fall von Ruminatio humana. St. Petersb. med. Wochenschr. 1881, No. 1.

Respecting the chemistry of the stomach in this condition, we have recently received the conclusions of four closely consecutive communications by Alt, Boas, Jürgensen, Einhorn, and Sievers,* which certainly do not quite agree; they found hyperacidity four times, subacidity once, and anacidity twice. According to this there is nothing essential about the chemical condition of the stomach in rumination; it appears to be only an accidental factor, and it would not surprise me if different degrees of acidity were to be found at different times in the same patient under identical conditions, because such variations are quite in accordance with the nature of many neuroses.

However, treatment in these cases, based on the chemical result—in Alt's case and in the three cases of Sievers with hyperacidity, the administration of alkalies, and of acids in Boas' case with subacidity—proved of use, and this is the more important as medicinal treatment hitherto has generally been without any effect. But in a case where the internal administration of morphine, in doses gradually rising to 40 cgrms. (6 grains) *per diem*, seemed to be powerless, Rossier observed that alleviation followed large doses of opium (1·5 grm.! ? 20 grains). In general it appears, as in a case described by Pönsgen, that an energetic determination not to allow the food to come back is the best remedy. Expectoration of the food may lead to serious disturbances of nutrition and loss of strength, as a case recorded by Sauvage shows, where a patient after he had ruminated for thirty years, was ordered by his father confessor to spit out the food. In consequence of this, distinct emaciation occurred, which improved when he returned to his old habit on the advice of a physician.

---

* K. Alt. Beitrag zur Lehre vom Merycismus. Berl. klin. Woch. 1888, Nos. 26 and 27.—J. Boas. Ibid. No. 31.—Chr. Jürgensen. Ibid. No. 36.—Sievers. Finske Lakares allskapt. 1889, Bd. 31.—Einhorn. New York med. Record, 1890.

If the relaxation of the cardia in rumination is more an assumption than a proved fact, it is still more doubtful whether *incontinence of the pylorus* occurs, a condition which was supposed originally by L. de Séré,* and recently by Ebstein, to be a special nervous affection. Whilst incontinence of the pylorus without doubt has been proved by Ebstein † to occur in connection with rigid new formations, and is based on the nature of the facts, we unfortunately do not possess any solid diagnostic criterion for deciding whether such a condition, which might be attributed to atony of the muscle of the pylorus, can take place in purely nervous disorders. It is an occurrence quite within the domain of normal processes for the pylorus to be temporarily incompetent during fasting. As Kussmaul has observed and numerous experiments have taught us, it is very easy to bring up intestinal contents or bile by introducing a tube, especially if the patient has fasted longer than usual, so that it must be allowed that in these cases the pylorus cannot be shut tightly. It would therefore be very difficult to distinguish such physiological occurrences from those that are pathological. But the diagnostic criterion suggested by Ebstein, namely, the rapid passage into the bowel of carbonic acid gas, artificially formed in the stomach, is shown by this to be uncertain and very fallacious. In the first place, the coils of intestine which are pushed up against the abdominal wall by the distended stomach, look just as if they were disturbed by air which had passed from the stomach. Secondly, different individuals require very different quantities of effervescing powder to distend their stomachs, and the contents which may combine more or less with the carbonic acid gas exercise an influence, so that distension may not occur and yet the pylorus be competent. At any rate, this incompetence is very rare. In the numerous cases in which I have distended the stomach with gas, I have never met with a case of pyloric incompetence, but as a rule, when a certain degree of tension was attained, the gas was expelled by explosive eructations. However, I believe that certain dyspeptic symptoms are due to such a condition, but rather from reflux of the intestinal contents into the stomach than from free exit of the stomach contents into the bowel. Otherwise I agree completely with Ebstein and Zeckendorf,* that in cases of acute intestinal tympanitis in hysteria, a great deal is due to air swallowed and quickly passed on into the bowel, under which circumstances there must necessarily be pyloric incontinence. But possibly another of my observations has a bearing on the occurrence of incompetence. Not very rarely in examining the stomach contents, we meet with persons whose stomachs are empty at the ordinary time after the test breakfast, that is, in an hour, or even in three quarters of an hour, whilst it is easy to perceive by pouring in water that the apparatus of expression or aspiration works quite well. In such cases the stomach contents must have passed unusually early into the bowel, but it must remain undecided whether this is due to increased peristalsis overcoming the normal pylorus, or to its incompetence.

---

* L. de Séré. Du relâchement du pylore. Gaz. des hôp. 1864, No. 62.

† Ebstein. Ueber Nichtschlussfähigkeit des Pylorus (incontinentia pylori). Volkmann's Klinische Vorträge, No. 155; and some remarks on the non-closure of the pylorus, Deutsches Arch. f. klin. Med. Bd. 36, p. 505.

Atony of the stomach.—This is a very important, but hitherto insufficiently appreciated neurosis. We have learnt to recognise atony and its consequences as a concomitant of many dyspeptic conditions, but undoubtedly atonic states of the muscular wall occur as a primary neurosis, as an independent disorder of innervation, which may be due to local or central causes, and is frequently the cause of dyspeptic disorders. Atony may be caused by defective or too laborious movements of the stomach contents, but I need not repeat what has been said of this alternation of cause and effect, and I will only insist on the fact that by "atony" we understand an affection of motion only and not of secretion, and that it is a condition in which there is a disproportion between the muscular power and the work to be performed, giving rise to insufficiency of the stomach (Rosenbach).

Atony may be partial or complete, or it may affect only the pyloric or cardiac portions, or the whole stomach. Such a differentiation appears to me to be favoured, by what has been recently repeatedly shown respecting the independence of the peristaltic movements of different portions of the stomach.

---

* **Zeckendorf.** Ueber die Pathogenese der Bauchtympanie. Gotting. Dissert. 1883.

Undoubtedly, the researches of Schiff, of Hofmeister, and of Schütz on the movements of the stomach,* and the observations of v. Pfungen† on a case of gastrostomy, according to which the movements of the body of the stomach are three times as weak as those of the *antrum pylori*, the latter being more concerned in the expulsion of the chyme and the former in the trituration of the food—undoubtedly, I admit, these researches are of great interest, but we know after all so little respecting the course of the movements of the stomach under pathological conditions, that we are very pleased if we are in a position merely to diagnose with certainty that they are disordered. Nor can I see any advantage in being able to differentiate between atony of the *antrum pylori* and of the stomach proper. For clinical purposes, atony of the body of the stomach must be the more important and effective factor. When movement of the body of the stomach fails, it cannot be compensated by increased peristalsis of the antrum; but where normal or increased peristalsis of the body of the stomach is coupled with atony of the pyloric portion, the expulsion of the chyme not only meets with no obstacle, but must be more easy than normally, because an atonic state of this part is not conceivable without some diminution of the tonus of the pyloric ring, and the muscular power of the remaining part of the stomach is quite sufficient to drive the chyme with ease through the passage which is resting in the cadaveric position. Perhaps we might assume that under such conditions, at the beginning the relaxed antrum effects a sort of closure by contracting the circular muscles of a limited part of the stomach, and so, in spite of vigorous peristalsis, the stomach contents would not get into the bowel; this, at least, is what v. Pfungen suggests in explanation of an observation of Kussmaul's.‡ But such theories would lead us into the wide ocean of speculation, which we wish to avoid as far as possible.

III.—MIXED FORMS.

Neurasthenia gastrica (*nervous dyspepsia*) I regard as a mixed form, in which the above described neuroses are more or less prominent, but which is characterised by a vigorous participation of the whole intestinal tract, the condition recently much discussed under the name of nervous dyspepsia.

---

* See Part I., p. 66.

† l.c., p. 261.

‡ Kussmaul. Deutsches Arch. f. klin. Med. Bd. vi. p. 470.

It is singularly difficult to arrange in a well circumscribed clinical description. Like a medusa, when we grasp it, it melts away in our hands. If we keep to what the name implies, we can understand by it only actual digestive disorders, dyspeptic conditions, which lead to a definite change in the chemistry of the stomach. But if we follow the definition which Leube in his original work * has supplied to the conception of nervous dyspepsia, namely, that it is a condition in which there is dyspeptic pain without digestive disturbance, that is, without any alteration in the chemistry of the stomach, we have, as Rossbach justly remarks, a group of symptoms resembling dyspepsia without dyspepsia. The inconvenience of such a nomenclature can be appreciated by every one. According to Leube† nervous dyspepsia is a group of symptoms originating in the abnormal sensibility of the sensory nerves of the stomach to the ordinary processes of digestion; those cerebral symptoms especially preponderate which we have described above as indications of sensory irritation.

Stiller, on the other hand, applies the name nervous dyspepsia to every condition in which digestive disorders react on the stomach from the central nervous system, or the sympathetic through these nerve centres, and occasionally lead to distinct anomalies of stomach function. Whilst the first of the authors just named goes from the centre of the circle to the periphery, the second moves from the periphery towards the centre. Whilst the first considers the proper peptic function to be undisturbed, the second admits it to be altered under certain conditions, and indeed in the majority of cases.

It cannot be said that truth, as it so frequently does, lies in the middle, as under certain conditions and limitations both statements are correct. There are cases, and these are the rarer cases of Leube, which present the appearance of nervous dyspepsia; only I believe in course of time, as our methods of examining the stomach increase in delicacy, this group will become gradually

---

* III. Congress für innere Medicin zu Berlin.

† Leube. Ueber nervöse Dyspepsie. Deutsches Arch. f. klin. Med. Bd. xxiii., 1879.

less. Leube's criterion of normal gastric digestion, viz., that a healthy stomach is empty six or seven hours after eating, has been shown by further investigation to be insufficient. Rossbach, Riegel, Rodzajewski,* myself, and others, have insisted upon the variability of this factor. More thorough examination of the digestive processes has shown me that in quite a number of cases in which the nervous troubles were characteristic, there were alterations in the chemistry of the stomach, and we must not forget that our chemical methods of investigation are still relatively coarse, that we are quite in the dark as to the amount of pepsin secreted, and that they give us only insufficient information on the vigour of absorption and motion, that we are therefore only in a position to recognise coarse changes, and that there are many alterations lying outside of these limits which we are unable to detect. The same may be said of anatomical changes. Jürgens† has communicated an important discovery in this direction. In forty-one cases which in life had complained of dyspeptic disorders of a vague nature, total degeneration of Meissner's and Auerbach's plexuses was demonstrated, thus giving a tangible anatomical basis to these cases, some of which it appears had received the clinical diagnosis of "reflex dyspepsia." Also where "the disorders appeared chiefly sensory" he found "a degeneration of the muscularis mucosa of the stomach and bowel, and a marked formation of varices on the inside of the intestinal wall, careful investigation of which showed that there was not only degeneration of the muscular walls of the veins, but that in their neighbourhood there was also a degeneration of the sensory nerves and of Meissner's plexus." These are discoveries—unfortunately their minute description has not yet been published—which when confirmed and multiplied must restrict the boundaries of nervous dyspepsia on this side.

On the other hand, it cannot be doubted that in the majority of cases obscure lesions of the extragastric nerves, of a direct or reflex nature, are referred to the stomach or give rise to direct disturbances of gastric digestion.

But in either case the clinical picture is made up of a mosaic of those symptoms which I have described as irritating or paralysing phenomena, a pavement in which now this, now that stone is absent, or this or that sticks up, which cannot be fixed once for all, but which, like man himself, presents a kaleidoscopic picture. Only it is characteristic that the disorders are of a mild nature, and that severe forms of gastralgia and cramp, of nervous vomiting, polyphagia, and bulimia are not met with.

---

* Rodzajewski. Ueber die Digestionsdauer im Magen als diagnostische Methode. Petersb. med. Wochenschr. 1885, Nos. 32 and 33.

† Jürgens. Verhandl. des III. Congresses für innere Medicin. p. 253.

Among the patients of this class some may be found who present symptoms of defective intestinal digestion, as well as of disturbed gastric digestion. "What I have most to complain of," wrote one of my patients to me, "is a feeling of oppression during prolonged walking or bodily movement, a sour taste in the mouth, and obstinate constipation. I feel no hunger, and never know when I shall begin to eat and when to stop eating." In certain cases the latter symptoms are more in the background, and are confined to the consequences of diminished or increased peristalsis—generally constipation, more rarely diarrhœa—or the evacuations of the bowel take place normally but the absorption is disturbed, the patient gets continually thinner, in spite of a good appetite, &c. Such cases were recognised by Möbius[*] some time ago. Another group, on the other hand, presents intestinal symptoms of such a prominent kind that one is disposed to place it in a distinct class, as Cherchewsky[†] has recently sought to do. Here, besides slight gastric disorders—want of appetite, distaste for food, coated tongue, slight nausea—there are pains which might be not improperly described as visceral neuralgias. The stools are irregular, generally sluggish, and are accompanied by abdominal pains, which are partly diffusely distributed over the whole belly, and in part permit the recognition of specially painful spots. The belly is seldom retracted, generally full, and sometimes greatly distended, with resulting passage of large quantities of air, greatly to the patient's distress. The gas escapes in part as ructus, in part as flatus, and has given rise to the name *dyspepsia flatulenta*. To this are added symptoms of a purely nervous nature, which are only to be distinguished from those observable in the gastric form by being much more intense, and decidedly causing anxiety.

---

[*] P. Möbius. Ueber nervöse Verdauungsschwäche des Darms. Centralbl. f. Nervenheilk. von Erlenmeyer. VII. Jahrg., 1884, No. 1.

[†] Cherchewsky. Contribution á la pathologie des névroses intestinales. Revue de Médecine, 1884, No. 3.

Let us remember what was stated in the introduction to this chapter respecting the innervation of the stomach and intestine, which should teach us that there is nothing strange in the frequent overlapping of symptoms derived from either organ. The numerous nerve loops of the entire intestinal tract, the fibres of the vagus, the splanchnics and the different sympathetic ganglionic plexuses stand in such a close relation to each other that where one organ is affected the other must necessarily be affected also, whether we seek its origin in the centre or the periphery.

I have therefore proposed the expression *neurasthenia gastrica*, or *vago-sympathica*, for this group of symptoms, which may be divided into gastric and intestinal, according to the organ most prominently affected.* This name appears to me to be better and more proportionate to the importance of the condition than that of nervous dyspepsia, which, for reasons well expressed by Leyden,† I do not like. It appears to me to be much more correct, and more in harmony with the weight of evidence and the character of Leube's clinical description, to leave "dyspepsia" quite out of the question, because any defect in the peptic power of the stomach is either altogether absent, or at least occupies a by no means prominent place.

I have already stated that the symptoms of *neurasthenia gastrica* are composed of the different nervous disorders already described, and that therefore they can present no specific features.

The same is true of R. Burkart's painful pressure points in the abdomen, which we have described before. They have nothing that is specific or characteristic of gastric neurasthenia. They are not to be confused with the so-called gastralgias and enteralgias, and the painful sensations in the abdominal wall, which not uncommonly radiate in the form of lancinating pains from the pit of the stomach, and may well be described, following Briquet, as epigastralgic pains.

In his well-known publication,‡ Leube drew attention to the fact that the symptoms connected with digestion always precede the symptoms of general nervousness, or, as now-a-days people prefer to call it, of neurasthenia.

---

* Ewald. Verhandl. des III. Congresses für innere Medicin.

† E. Leyden. Ueber nervöse Dyspepsie. Berl. klin. Wochenschr. 1885, No. 30.

‡ Leube, l.c.

The authors who have since occupied themselves with neurasthenia gastrica have, according to their points of view, laid special weight on this. Doubtless there are cases in which no cause at all can be found. Fenwick* asserts this of the majority of his cases, but, in fact, we miss the indications of a nervous predisposition in only a few cases. There are either nervous diseases in the family, or there have been excessive strains on the nervous system—grave emotional disturbances, dissipation, excessive brain work, sexual irregularities—or the condition called cerebral or spinal irritation already exists, or there is an abnormal condition of the nervous system bordering on hysteria. Thus I have for a long time had under my care a young gentleman of eighteen, whose father suffers from decided spinal irritation. In the case of an older gentleman, who had suffered for years from peculiar nervous symptoms, which were always connected with irregularities in his intestinal digestion, there developed the most complete neurosis of the intestinal tract. But there are also—certainly only rarely—cases in which the neuroses of the intestinal tract occur without such prodromata. If such cases are observed for a longer time, as a rule the occurrence of some other neurasthenic symptoms will be established. I have frequently seen a young lady in whom a condition develops at the onset of menstruation, which originally could only be described as neurasthenia gastrica, but which assumed the shape of hysteria, with severe attacks of gastralgia and enteralgia. Such occurrences are, however, obviously only rare, and always leave room for the suspicion that they were hysterical from the first; in fact most of the cases described in this chapter would formerly have been so regarded. They have been long known; but what we owe to recent times, and especially to the labours of Leube, is their more exact definition, and the chemical proof of the integrity of the digestive secretions.

But I might mention here that those nervous conditions which we meet with as prodromata of dyspeptic disorders are frequently made worse during the occurrence of the latter. Not only do pains in the back and head, heaviness in the legs, &c., occur, but also the mind becomes melancholy and gloomy, the patients see the black side of everything, make unnecessary troubles, and lose the remnants of vital energy which they still possess. In one of my cases the patient complained of feebleness of memory and incapacity to concentrate his thoughts; in another I found that every time the dyspepsia, which was always more or less present, increased in intensity, violent giddiness occurred. At the same time the pulse became frequent and small, the hands and feet livid, cold, and tremulous, with palpitation, oppression, and shortness of breath, increased on walking or going up stairs. This increased to the most intense fear of death, which tormented the patient horribly until the passage of flatus suddenly brought ease, and the scene changed. But it was not possible for the patient, a tall and well-built man, to overcome the overwhelming fear of death, although he knew the course the attack would take.

---

* Fenwick, On atrophy of the stomach and on the nervous affections of the digestive organs. London, 1880.

But in all these cases we have to do, as I would expressly remark, with dyspeptic conditions on a nervous basis, never with the concomitant symptoms of a real organic lesion of the central nervous system, such as occur as reflex neuroses, for example, in the gastric crises of tabes, in diffuse or localised brain lesions, in lesions of peripheral nerves, in chlorosis or menstrual anomalies, uterine and ovarian troubles, or severe mental excitement, and which give rise to nervous diarrhœa or constipation. These conditions, in opposition to the chronic, and, if I may say so, the milder character of neurasthenia gastrica are much more acute, develop rapidly with very intense symptoms which only occur once, or recur periodically. Such attacks are described by Richter in his paper in the Berl. klin. Wochenschrift; and such cases have been described by Leyden in a series of excellent examples.* They have only so far to do with what I mean by neurasthenia gastrica as they contrast with those forms of psychoses or neuroses in which the anatomical changes in the nervous system are not to be demonstrated by our present methods.

But whilst we cannot say with certainty that important pathological changes are present, we are generally, if not always, justified in excluding marked changes in the chemistry of digestion. In many cases certainly a transient or long standing indigestion, a slight catarrh, or an often recurring hyperæmia, &c., has given the first impulse to the direct expression of nervous symptoms in the digestive organs. Indeed such disorders may recur in the course of the affection, and, supported by the underlying condition, they temporarily aggravate it. But if in chlorosis we meet with leucorrhœa or dyspeptic disorders, or if in Bright's disease we find the optic nerves affected, such conditions are only regarded as symptoms of a general disorder.

---

* Leyden. Ueber periodisches Erbrechen (gästrische Crisen). Zeitschr. f. klin. Med. iv. 1882.

According to my view there can be no doubt that these nervous symptoms are the expression of general nervous debility or neurasthenia. In a few cases this shows itself only in the nerves of the stomach and intestine; in such instances these appear to be primarily diseased, and we have to do with a peripheral affection of the nerves. In the great majority they are combined with other nervous symptoms, and take only a prominent place in the clinical picture.

For the diagnosis of dyspeptic neurasthenia characteristic symptoms are wanting. It is impossible to make a diagnosis from the positive results of examination and the subjective complaints of the patient at the time, all the more as not infrequently actual organic diseases are accompanied by neurasthenic conditions. By watching the course of the disease, the influence of etiological factors, the miscarriage of all therapeutic measures directed to genuine gastro-intestinal diseases, and by careful estimation of all signs of neurasthenia we may be helped to a correct diagnosis. Of great importance, as has been remarked with justice by Burkart, is the peculiar aspect of certain symptoms owing to their relation to one another and their variable occurrence.

Still I may adduce the following indications. In the first place, the gastralgic pains are as a rule diffuse, and have not the distinct sharply localised character met with in ulcer and carcinoma. They are also much less dependent on taking food, although this condition presents many differences in carcinoma. In the second place, vomiting is rare in gastric neurasthenia. When it occurs it consists of mucus mixed with bile and more or less digested remains of food, but no blood or decomposed matter. It is distinguished from hysterical vomiting by the ease and regularity with which the latter generally occurs. It has no putrid taste, being only bitter. I agree with Liebreich, that this is not due to bile but to peptones, which it is well known taste very strong and bitter. In eructation attended by rising of bitter matter, this is known to be peptone. In the third place, the stools, of which in course of time a large number have been examined, show the ordinary variable characters, as described first by Lambl, and more recently by Nothnagel.* I have in no case found a large amount of undigested food, abnormal quantities of mucus, or any blood in them. The shape of the dejections varies. I have not observed any typical condition, and ribbon-like dejections, upon which Cherchewsky lays so much stress, are only seldom seen.

With respect to differential diagnosis I will not discuss the tumours, ulcers, strictures, &c., which are recognisable by palpation, inspection, or quite characteristic symptoms, but will only note the following points.

Leube has recommended the so-called digestion test as an aid to differential diagnosis. According to Leube, in healthy stomachs or neurasthenia gastrica the stomach is empty seven hours after a simple meal, and in the water with which it is washed out there are no traces of food. I admit that this is correct in most cases, but I have adduced already certain exceptions to this rule.

Leube himself, in relating six cases of neurasthenia dyspeptica, mentions two in which the stomach contents were not digested in seven hours, and contained no acid.† Conversely I have found the stomach in this time quite empty in not too far advanced gastric catarrh, ulcer, and carcinoma. If, therefore, we may generally conclude that the condition is normal if the stomach is empty, we cannot do so with certainty. The chemical examination of the stomach contents gives similar results. I have found gastric juice in chronic catarrh where there was no question of a nervous basis, in ulcer and even in carcinoma, which, when examined by our chemical methods, showed quite normal relations in respect to its acidity and digestive capacity. Hence we must be cautious in drawing any far-reaching conclusions from the chemical examination of the stomach contents, and we must consider that in living beings there are many factors participating in the function of the organ which we cannot reproduce in our test tubes and retorts, and which we cannot recognise by chemical reagents.

---

* Nothnagel. Beiträge zur Physiologie und Pathologie des Darmes. Berlin, 1884.

† W. Leube. Beiträge zur Diagnostik du Magenkrankheiten. Deutsch. Archiv f. klin. Med. Bd. xxx.

If we desire to settle the diagnosis of a suspected ulcer, you must remember that in such cases, and as already laid down on p. 466, I dread and avoid the introduction of a tube on account of the possibility of an ambiguous result, and the fear of causing perforation. Therefore, under these circumstances it seems to me much more important to begin by treating the presumptive ulcer according to the method already laid down, and to allow the diagnosis to depend on the result of this treatment.

We must be quite clear about this, that in very many cases it is impossible to recognise a neurosis off-hand, and that only prolonged observation and careful inquiry into the history and general condition of the patient can lead us to a safe diagnosis between ulcer, primary or secondary, hepatic obstruction, or even carcinoma and chronic tubercular processes. Even intercostal neuralgia has given rise to errors, and although such a case has never occurred to me, and doubtless is rare, yet we must bear it in mind.

The prognosis and treatment of neurasthenia gastrica depend upon its nature. The functional anomalies present can easily be mastered if they are not constantly being reproduced by central causes. As in all neurasthenic affections, the prognosis is very uncertain. There are cases which under appropriate treatment rapidly improve, and remain well permanently or for a time, and there are others which for years defy the continuous use of rational therapeutics. What course a particular case will take cannot be foreseen. We might think that when the symptoms had been very slight we might hope for improvement, and the reverse. But I have been repeatedly deceived in this. Cases which are apparently very severe get well very rapidly, while apparently mild cases drag on for years. In any case we must assume that the case will be prolonged for months at least, and that the external appearance of the patient is no guide to the severity of the neurasthenic phenomena. I have frequently had under treatment young men who were the pictures of blooming health, and whose complaints were ridiculed by their acquaintances. There are other patients who distinctly run down, emaciate, and become so ill that English authors have recorded instances where the debility was so severe as to prove fatal with ultimate œdema and rise of temperature.

IV.—REFLEXES FROM OTHER ORGANS.

By these I understand tangible changes in other organs, resulting in affections of the nerves of the stomach, with symptoms, as in all reflex phenomena, at their seat of origin; *ablata causa cessit effectus* is especially appropriate here. But so very frequently the cause of the disease is wrongly sought for, not at its primary seat but at the place secondarily involved, that a short enumeration of the reflex phenomena known to us may serve to remind you, gentlemen, which organs and diseases are especially liable to come under consideration.

The reflexes manifest themselves, 1, by slight disturbances of digestion; 2, by gastralgia; 3, by vomiting; the last more in acute, and the first in chronic affections. But the three types run into one another and are combined with one another, and also when processes running a chronic course are suddenly exacerbated, or when in their course they affect specially predisposed nerves—I am thinking, for example, of tabetic crises—the symptoms of an acute stomach disorder may be induced.

The fact insisted on repeatedly that the stomach is the centre of a widely branching nervous plexus, which places it in direct or indirect communication with nearly all the organs of the body, involves the expression in the stomach as an end organ, of any stimulus created at any part of this plexus. The reflexes occur chiefly in affections of the central nervous system, of the great abdominal glands, of the bowel, of the genital organs, finally of the lungs and the heart.

The brain affections—inflammations of the meninges, hæmorrhages, abscesses, tumours—are generally accompanied by transient or persistent vomiting, and as Andral* knew, by hypersecretion of gastric juice, so that in such cases the frequent occurrence of *post-mortem* softening of the stomach is explained by the abundant secretion of acid gastric juice. Vomiting occurs in the course of the disease, but it may open the scene and cause serious mistakes, as it is well known to do in meningeal hæmorrhages, especially in children, and in tumours. Every case of persistent or quite uncontrollable vomiting should be considered with these possibilities in view. Among these forms of reflex vomiting we may reckon the vomiting of sea-sickness, of migraine, and that seen at the commencement of mental diseases. Of the latter eventuality I have noted two cases, where very obstinate vomiting appeared to develop in the course of gastric catarrh, and in which, after it had disappeared at the end of some weeks' attendance, it left behind a disorder of the mind. The diseases of the cervical and dorsal cord cause gastralgia with vomiting as soon as the process irritates the centres or nerve roots concerned. Not only in grey degeneration of the posterior columns (tabes), but also in insular sclerosis, such "gastric crises" may occur. As to the chemical constitution of the gastric fluid in such cases there is no definite rule. Sahli suggested some time ago that there is hyperchlorhydria, but according to my observations and those of von Noorden* the degree of acidity is very different at different times, and is much more often below than above the average. Moreover, vomiting is a frequent occurrence in abscesses and calculi of the liver and kidneys, especially when the latter pass into the ducts and irritate the sensory nerves.

---

* Quoted by Budd, l.c.

Respecting vomiting in pregnancy I desire only to point out that it is not only a very common form of stomach reflex, but that it is a not uncommon source of diagnostic doubts and errors of judgment. How often do we find that questionable vomiting combined with severe dyspeptic disorders, such as complete loss of appetite, continued bitter or disagreeable taste in the mouth, restlessness, sleeplessness, and severe prostration, simulating a severe gastric disorder, is the first indication of pregnancy. As the vomiting is caused by the pressure of the enlarged uterus on the sympathetic nerve fibres, it continues so long as the uterus is in the true pelvis, that is, in the early part of pregnancy. It may amount to uncontrollable vomiting if the uterus is abnormally large or mis-shaped, or if its muscular wall is inflamed, or if the organ is displaced. But also acute injuries or rough handling of the uterus may give rise to vomiting, as, for example, in a case where it followed ligature of a polypus of the fundus uteri. In such a case, Dr. Daumann saw vomiting and pain occur every time he tried to draw the loop tight, whilst the vomiting ceased when he loosened the ligature. The same is true of operations on the bladder, the urinary passages, &c.

---

* v. Noorden. Zur Pathologie der Tabes dorsalis, Charité-Annalen, 1890.

Chronic diseases of the female and also of the male sexual organs may cause chronic dyspeptic disorders; you may be reminded that even the normal process of menstruation, as originally pointed out by Kretschy,[*] and confirmed by Fleischer,[†] Boas and myself,[‡] causes retardation of digestion, or even complete failure of free hydrochloric acid in the gastric contents. How much more may conditions of amenorrhœa and dysmenorrhœa, the climacteric and chronic disorders of the uterus which are connected with an irritable condition of the uterine nerves, or possibly with direct stretching of them, lead to reflexes in the stomach and bowel. It is easily understood that Kisch [§] found "dyspepsia uterina" most frequently in retroflexion of the enlarged uterus, then chiefly in various displacements, in myoma, in pelvic exudations, with dragging on the uterus and its annexes, in follicular or cancerous ulcers of the cervix, and in ovarian tumours, while it was absent in simple mild inflammations of the uterine mucous membrane, chronic catarrhs, and slight perimetritic and parametritic exudations. In such cases dyspeptic disorders of years standing may be cured in a surprisingly short time by appropriate local treatment.

I have recently observed a peculiar and rare occurrence of a reflex nature, which affected first the salivary glands, and secondarily the stomach, giving rise to sialhorrhœa, and resulting dyspepsia. An unmarried lady of forty-one had suffered, according to the statement of her medical attendant, for about two and a half months from loss of appetite, bitter taste, constipation, feeling of weight in the stomach, and for many weeks from excessive salivation. She was decidedly emaciated, and felt very dull, and unable to employ herself, although she was usually very active. She lived on her means, and had employed Carlsbad water, condurango, argent. nit., with small doses of quinine, cold rubbing, and corresponding diet, without any benefit. On admission to the sanatorium she was found to secrete daily about two litres of saliva, which was examined in the laboratory of Professor

---

[*] F. Kretschy. Beobachtungen und Versuche an einer Magenfistelkranken. Deutsches Arch. f. klin. Med. Bd. 18, p. 257.

[†] E. Fleischer. Ueber die Verdauungsvorgänge im Magen unter verschiedene Einflüssen. Berl. klin. Wochenschr. 1882, No. 7.

[‡] Ewald and Boas. Zur Physiologie und Pathologie der Verdauung. Virchow's Archiv Bd. 104.

[§] H. Kisch. Dyspepsia uterina. Berl. klin. Wochenschr, 1883, No. 18.

Kossel, and found to be of normal composition. The chemistry of the stomach digestion was without any serious alteration. Acidity = 48. No other anomalies, the cavity of the mouth without noticeable affection. All kinds of chronic poisoning by mercury, gargles, hair-dyes, &c., were excluded. After fourteen days of treatment with atropine pills and local injections of morphia with only temporary benefit, I discovered a retroflexion of the uterus. A pessary was introduced, and the obstinate salivation and dyspepsia disappeared most speedily.

Finally, I have to mention the reflexes of the intestines which are caused by worms, intestinal calculi, and new growths in and on the intestine. Parasites play a great part here. I will not speak of the great nutritive disturbances which are caused by distoma and strongylus, or recall the disease of the tunnel and brick workers. Let us keep to our common ascarides and tæniæ, and not forget that many long-standing cases of nervous dyspepsia are cured by the expulsion of a tapeworm.

TREATMENT OF THE NEUROSES OF THE STOMACH.

In all nervous diseases of the stomach our therapeutic procedures must be guided by the irritative or depressive nature of the disorder. The conditions of increased irritability are to be distinguished according as they are due to local or central irritation.

For local hyperæsthesias, opium and its derivatives, morphine, codeine, and narceine, have long been indispensable. In general, morphine is best administered internally in water or bitter almond water, because in substance it is not soluble in the stomach, and has little or no effect. It acts most quickly when given subcutaneously *in loco affecto*, where I employ it in the English fashion, combined with atropine, partly to prevent its emetic action, partly to avoid the laxative effect of atropine. This combination is splendid, and may be used in cases in which simple solution of morphine causes obstinate nausea and vomiting. We may also employ extract of opium, dissolved in glycerine diluted with water, and injected subcutaneously, as it is recommended, at least by Rosenthal, in bulimia, for example. I have never found it necessary to use it. If the employment of morphine is desirable on account of its general sedative effect on the nervous system, and if there are reasons for not giving it *per os* or subcutaneously, it may be administered in suppositories of from 0·03 to 0·05! or even up to 0·1 or 0·15 daily (½ gr. to ¾ gr., or even of 1½ gr. to 2¼ gr.!). By the side of opium and morphine stand small doses of hydrocyanic acid in the form of aq. amygd. amar. Recently cocaine has been added, the salts of which can be given unhesitatingly in doses of 0·05 to 0·1 grm. (¾ to 1½ gr.), but it must not be forgotten that it causes in many persons considerable excitement in the form of sleeplessness, restlessness, pulsation of arteries, oppression, and headache. For prolonged use and in slight disorders we may employ coca wine occasionally with good results. For easing spasm we should use preparations of belladonna, extr. belladonnæ, or the alkaloid in the form of pill, or the tincture.

The use of the following formula has proved very satisfactory to me in cases of hysterical hyperæsthesia, gastralgia, vomiting, and even in spasmodic conditions:—

℞

Morph. muriat.	0·2
Cocain. muriat.	0·3—0·5
Tinctur. belladonnæ	5·0—10·0
Aq. amygd. amar.	25·0

M.D.S. Ten to fifteen drops every hour.[*]

Indispensable as is morphine, its subcutaneous employment in all chronic diseases is known to be so two-edged, and in these neuroses there is such a terrible danger of inducing morphinism, that patient and doctor should never lose sight of this.

This is not to be feared of chloral, which is an excellent sedative in a 3 or 5 per cent. solution, taken with cocaine every hour and a half or two hours. Sulphonal is a good

---

[*] This formula may be approximately represented in our measurements as follows:—

℞

Morph. hydrochl.	gr. iij
Cocain. hydrochl.	gr. v to vij
Tinct. belladonnæ	m. 75 to 150
Aq. amygd. amar.	ad ℥j
	M

Sig. Ten to fifteen drops every hour.

Trans.

remedy for sleeplessness, but it is useless in dyspeptic disorders, and we must bear in mind that some persons are badly affected by even small doses of it. The preparations of bismuth act most feebly and not always surely in relieving pain; they may be combined with morphine, or extract of henbane, or with rhubarb in mild cases, and especially in children. For quicker relief of pain it is recommended to swallow little pieces of raw ice, made into pills, with three to five drops of chloroform. The same result is obtained with chloroform water, made by decanting water from an excess of chloroform and diluting it with half aromatic water; of this a tablespoonful should be taken several times a day. In gastralgia many authors — Rosenthal, Leube, Vizioli, and Rosenbach — have repeatedly seen the anodyne effects of the constant current with ultimate disappearance of the attacks. Galvanic chains (zinc plates to the lumbar vertebræ, silver plates to the stomach), when used for a long time, have a soothing effect. The results of local treatment by means of the internal stomach douche are sometimes surprising, as recommended originally by Malbranc * (Kussmaul's Clinic). It appears as if this massage exercised a calming influence on the hypersensitive stomach nerves, just as massage proper often influences painful neuroses in a surprisingly favourable manner. Malbranc, as the interpreter of Kussmaul's treatment and views, adduces the following factors in explanation of this favourable action of the stomach douche, of which, however, only the last-named can be in question in the case narrated: 1. The emptying of the stomach from stagnating remains of food. 2. The purification of it from acrid, irritating matter (decomposition products) and mucus. 3. The calming effect of the warm-water bath. 4. The stimulus of peristalsis by the powerful stream of water. 5. The slightly anæsthetic and at the same time stimulating effect of the carbonic acid gas on the contractions of the stomach. 6. The increased intestinal peristalsis combined with the two last points. As an example of the favourable action of the douche, the following case, shown to my class on October 7th, 1887, may serve: A woman, aged thirty-six,

---

* M. Malbranc. Ueber Behandlung von Gastralgien mit der inneren Magendouche nebst Bemerkungen über die Technik der Sonderung des Magens. Berl. klin. Wochenschr. 1876, p. 41.

slightly built, came ten days before complaining of violent gastralgia, complete loss of appetite, and great depression. She looked ill, with dull and heavy eyes, as if she had had sleepless nights. Her illness began five months before with spasmodic contractions in the stomach. The attacks had been for the last eight weeks most persistent, occurring many times a day, almost without cessation, and even at night quite independently of food. The patient was married and had one child. There was nothing abnormal in the stomach or abdomen, and the heart and lungs were healthy. She had quite a bundle of prescriptions of different narcotics and sedatives, all of which had been taken without any result. Expression of the fasting stomach obtained about 30 cc. of neutral cloudy yellowish fluid, unmixed with mucus. There was obvious reflux of the intestinal contents. After the test breakfast very feeble acidity, with traces of hydrochloric acid. She was douched four times, with the result that only indications of the pains occurred during the day, the appetite was established, and greater quantities of nourishment were taken.

To such a "bracing up" of the nervous system we may also attribute the good effect of the introduction of the stomach tube, and feeding by its means in severe reflex vomiting, especially in the vomiting of pregnancy, of which many instances exist in English literature.

On the other hand, I agree with Oser* that washing out the stomach has no permanently good effect in hypochondriasis. So long as you wash them out they feel better, but so soon as you stop doing so they are as bad as ever.

Among local means we must reckon wet compresses to the stomach region in the form of the simple Neptune's girdle, or soothing poultices of chamomile, valerian, &c. We may employ as derivatives mustard leaves, iodine paint, and the electric brush. An abdominal belt is of service to support the relaxed abdominal muscles.

Of means that act centrally there are, in the first place, the bromides, bromide of potassium, bromide of sodium, and bromide of ammonium, which must be given in large doses if a favourable result is to be obtained. Doses of two to three grammes two or three times a day should be taken, and doses which go to the limits of what is permissible are, as a rule, well borne, though there are patients who with small doses present slight symptoms of poisoning, confused head, heaviness in the limbs, characteristic odour in the mouth, even incontinence of urine. We should therefore begin with small doses, and in those cases where a prolonged course is desirable we should enjoin short pauses of from three to eight days' duration. Erlmeyer's bromine water is very good for use in such cases. Antipyrin, phenacetin, salicylic acid, and salol are only useful in doses of 0·5 to 1·0 grm. (7½ to 15 grains) in the hemicrania occurring as an accompaniment of stomach symptoms, but they are without direct influence on the nervous apparatus of the stomach.

---

* Oser. Wiener Klinik. 1875, p. 257.

Rosenthal, relying upon the observation that pilocarpine has checked obstinate hiccough, has employed this preparation subcutaneously with good results in spasmodic vomiting. If we are to start from such theoretical considerations, physostigmine should also be recommended, as its action in paralysing the nerve centres is well known, and has been recently confirmed by Riess and G. Meyer. The spasmodic jerking movements of tabetics have been in my experience very favourably influenced by physostigmine injections; perhaps it might have an equally favourable influence in gastric crises and in nervous vomiting.

We must also name here the preparations of caffein, valerianate of caffein, or the salicylate of sodium and caffein—0·1 (1½ grains) for a dose, twice or thrice daily—and nitro-glycerine, which is praised by Talma. Respecting the former I have no personal experience, except in migraine, where, as it is well known, every preparation that is recommended acts for a time, then sooner or later becomes quite useless. I have employed nitro-glycerine in two cases, on each occasion exciting such violent headache and vascular action that I have refrained from its further use. It was given in doses up to 0·5 mgrm. (ca. $\frac{1}{33}$ gr. or 3 minims of the ordinary 1 per cent. solution). In general the condition in question, in addition to soothing or regulating the nervous system, demands some amelioration of the general constitution by improving the tissue metamorphosis and the composition of the blood. For this purpose the preparations of *arsenic and iron* stand first.

Although at one time I generally used Fowler's solution and the arsenite of potash, I now use almost exclusively arsenic acid.

as recommended by Liebreich, either in solution (0·02 to 20, to be taken in increasing doses), or in granules to a milligramme (gr. $\frac{1}{33}$), or in the form of asiatic pills. If we take the precaution to prevent its irritating effect on the mucous membrane by taking it always after food, arsenic may be given for a long time, and in large and otherwise poisonous doses, that is, up to ten or fifteen milligrammes (gr. $\frac{1}{3}$ to $\frac{1}{2}$), without any injurious effect or secondary symptom. The waters of Roncegno and Levico in South Tyrol offer a very good combination of iron and arsenic; they may be used by very feeble and impressionable patients without inconvenience, provided they are begun in small doses (one teaspoonful once daily half an hour after the principal meal), slowly increased in the course of the next fortnight to one or two tablespoonsful.

Iron, apart from chalybeate waters, is best taken in combination with albuminates, as albuminate of iron. Preparations of iron are as abundant as the sand on the seashore, and each finds its supporters, but the advantages of one or other depend chiefly on individual conditions and accidents. I now use almost exclusively the chlorine compounds of iron, the easy absorption of which has been repeatedly remarked, in the form of tinct. ferri perchlor., or ferr. perchlor. in substance (combined with arsenic and quinine, or quinine in pills), or in the form of liq. ferr. perchlor. in 2 to 5 per cent. solution mixed with albumen water (1 part egg-albumen, 5 parts water) in teaspoonful doses. In this way we get an albuminate of iron, which can be taken by the most delicate stomach, and which is a good substitute for the expensive liq. ferr. album. of the shops. We must rank with hæmatogenous remedies the so-called tonics, cinchona bark and other bitter drugs.

To those means which, while soothing, are also strengthening, belong the various hydropathic procedures, the methodical employment of tepid hip-baths, general spraying with a tepid rain douche, the so-called Scottish douche, packing with cold water, and cold sitz-baths. I would warn you against the employment of too cold water, which frequently has an exciting and irritating effect. For this reason cold river or sea baths are frequently badly borne.

Such a mistake is not so likely to be made in the case of feeble and anæmic persons as in the not uncommon class of neurasthenics who appear to possess strong constitutions, or believe themselves to do so, and who imagine that the more the water makes them shiver with cold, so much the greater must be its curative effect.

For a certain group of nervous diseases of the stomach, in which conditions of persistent anorexia have led to profound disturbances of nutrition, great emaciation and bodily weakness, the so-called over-feeding cure is recommended. This treatment, which, as you know, was introduced by Weir-Mitchell and modified and practised by Playfair in London and by Burkart, Leyden, and Binswanger in Germany, aims at bringing about the ingestion and absorption of such a quantity of food as the patient could ordinarily neither take nor assimilate. With this object the treatment is composed of two parts—one psychical, and the other vegetative or dietetic. It is the business of the former to remove the patient from the injurious influences of his daily life and surroundings, and isolated from these conditions, to place him in a position where he will be subordinate only to the will of his physician, so that all ordinances shall be carried out, even to the most minute detail. Therefore the patient must be taken from home and placed in some institution.

The dietetic measures taken are those which will over-feed the patient to some extent, that is, in the first few days he is made to eat more than he feels any need for. At the same time the patient is kept in bed for warmth and rest, but passive muscular movements and improved circulation are effected by means of electricity and massage.

The cure begins with the patient being placed, so to speak, in solitary confinement, attended by a nurse who has chiefly to do with the feeding and the mechanical procedures, but still must possess the quality of not being disagreeable personally to the patient. The cure begins in the first few days by giving small quantities of milk every two or three hours, up to one or two litres (1½ to 3 pints) daily, which may be given boiled or unboiled, skimmed or newly milked, warm or cold, and according to the individual preference and taste of the patients, with various additions (lime water, soda water, barley water). After three or four days we may proceed with solid food, of which small quantities should be administered every two hours.

From the third to the fifth day stronger food is given in twohourly intervals; for example, milk, meat and bread, butter, coffee, or tea, so that daily about 2¾ litres (4 pints) of milk, 420 grms. (14 oz.) of meat, about 150 grms. (5 oz.) of vegetables or preserved fruit, and a corresponding amount of bread, roll and butter, are eaten. If the stomach succumbs to the demands made upon it, and responds by the development of acute gastric catarrh, evidenced by coated tongue, eructation, heartburn, and pain in the stomach and head, the regimen must be set aside for a few days. Care must always be taken to regulate the bowels.

In favourable cases improvement may be observed in two or three weeks. After the fourth or fifth week the patients may leave their beds and make attempts to walk. As improvement goes on the massage and faradisation should be gradually reduced until they finally are stopped completely. If no improvement occurs in the time named, it is better to abstain from proceeding any further with the cure.

Burkart has laid down the indication that the over-feeding cure should not be used, or only with the greatest caution, in any patients who show special cerebral irritability, or in whom disorders of the psychical functions occupy a prominent place in their malady. On the other hand, all those cases of severe hysteria and neurasthenia are especially favourably influenced in whom the functions of the digestive organs are chiefly affected, and where alimentation appears to be seriously impaired. It is especially the emaciated, enfeebled, and miserable-looking patients who offer the best prognosis for treatment by this method. "The revulsion to a healthy state of the digestive organs," says Burkart, "I nowhere saw occur more quickly than in those cases of digestive debility which we meet with in greatly emaciated hysterical patients, and which stand in intimate connection with abnormal functions of the mind." It makes a remarkable impression when in such cases we have the opportunity to observe how the same digestive organs which hitherto had reacted in a most unpleasantly obstinate manner to certain foods, and which appeared able to take and digest only small quantities of food, suddenly in a few days under Weir-Mitchell's regimen became able to assimilate colossal quantities of such food as hitherto had caused the greatest digestive disturbance.

The true nature of the functional disturbance is demonstrated in the most pregnant fashion by the way in which the organ reverts in the shortest time to its normal activity, contrasting so strongly with what happens in demonstrable anatomical organic disease. When cases of neurasthenia gastrica are subjected to Weir-Mitchell's treatment, their return to health is much slower than in the cases of hysterical dyspepsia.

Gentlemen, my experience of this method during the last few years has been very large in a modified and a milder form. I have not tried the genuine plan so often, because I have rarely felt that it was necessary to carry out what is a very expensive plan of treatment for the patient, and because in some cases, as Burkart and Leyden state, although the indications for Weir-Mitchell's treatment are present, the patient is unwilling to submit to separation from her family. Still, I have carried out the over-feeding cure carefully and cautiously in one case, and I had exact examinations made of the tissue changes. It was a case of hysterical anorexia in a young girl of sixteen, which developed as a sequela to scarlet fever eight years before. The patient was emaciated to a skeleton and suffered from headache, singing in the ears, colour blindness, and such photophobia that she sat in the dark and could not read a word. There were great slowness and tremor on movement. Incontinentia alvi. The body weight at the beginning was 25·6 kilos (ca. 51 lbs.), and the nitrogen exchange reckoned as albumen 37·19 grms. This on feeding became 114·42 albumen, and in four weeks rose to 195·77 grms. She remained secluded from December 5th to January 26th, and at this date she showed 124·06 grms. albumen exchange, a difference of 71·71 grms., and weighed 33·05 kilos (ca. 66 lbs.), a gain of 7·45 kilos (15 lbs.). I had the patient under observation for three months longer; she was with her nurse in her parents' house. She continued to increase in weight, looked well, went for walks, and was free from her former pains, and now two and a half years later, I can say that this good result has proved durable. It was in fact a splendid result, and certainly was only obtained in this case by the patient being free during the whole time from any but quite slight and transient symptoms of gastric or intestinal disturbance.

But it appears to me that in most cases we can attain the same result as by the strict observance of Weir-Mitchell's precautions, without isolating the patient, if we can only have a good nurse. No doubt a very important factor in the treatment, as stated above, and insisted upon by Burkart, who has incontestably had the greatest experience of this method in Germany, is the mental co-operation of the patient and her fixed desire, or at least her intelligent concert, in the objects of the treatment. But if these are present, and if the surroundings of the patient are suitable for the treatment, we may dispense with the isolation in a hospital, which no doubt greatly influences the mind. I have carried out many such over-feeding cures with good results in the homes of the patients, and know that this experience has happened to others also.

In concluding these remarks on this method, I may remind you of the importance of periodical weighing for nervous disorders, as well as for all diseases connected with disorders of the organs of absorption. A prolonged account of the weight in a positive or negative sense—and we must reckon as the latter very frequently stationary weight, on the principle that to stand still is to go backwards—is always of the greatest significance for forming an opinion of the cause of the disease and the results of our treatment; only we should not allow ourselves to be deceived or influenced by slight and inconstant variations of weight. Differences of one to one and a half kilos (2 to 3 lbs.) from day to day, or in the course of a few days, are ordinary occurrences, as I have observed in weighing for months naked persons whose food and conditions of life were quite regular. But, moreover, persistent loss of weight does not involve a bad prognosis, so long at least as the treatment is not being conducted in the right direction. Certainly all organic structural changes of a malignant kind are associated with constant loss of weight, interrupted by at most slight transient variations, and, so far, it is of an unfavourable character; but also nervous dyspeptics, neurasthenics, and the like may in a few months lose fifteen to twenty kilos (30 to 40 lbs.) in weight. The touchstone of correct and beneficial treatment is the gradual improvement of the body weight, which occurs sometimes shortly after the commencement of the regimen; sometimes after a preliminary period of persistent loss, which occasionally lasts for three or four weeks.

The weight plays, therefore, in all stomach troubles, of whatever nature they may be, but especially in its neuroses, a very important part, and must always be considered. The proposal of Beneke, that every one should keep an account of his body weight, has been put into practice by Prof. Thomas with great utility in the regulation of his diet (v. German Scientific Congress at Berlin, 1887), and is worthy of attention.

Finally, in the treatment of the neuroses of the stomach, all those adjuvants are of service which effect a general improvement of the body and mind by means of change of scene, the stimulating and restful influence of mountain and country air, visits to the sea, strengthening waters, such as the alkaline waters of Franzensbad, Ems, Neuenahr, even the saline waters of Wiesbaden and Kissingen, the mild iron waters of Elster, Franzensbad, Pyrmont, Rippoldsau, &c., and last, not least, mud-baths. The latter can scarcely be had anywhere better than at Franzensbad, where, as Frerichs stated in the last of the publications from his pen, there is splendid material ready to hand, while all the arrangements are most carefully looked after, and are based on many years' experience of the treatment. I must once more warn you against the use of sulphate of soda springs, especially those of Carlsbad and Marienbad, as being frequently injurious in nervous disorders, because not only is the water of those places slowly and badly absorbed, and "lies heavy on the stomach," but it exerts a distinctly debilitating influence, increasing tissue metamorphosis, flooding the blood with neutral salts that are not sufficiently excreted, and not only not improving the nutrition of the nervous system but lowering it. Towards the end of most summers I see such patients returning from these spas with their state distinctly aggravated.

LECTURE XII.

THE RELATION BETWEEN DISEASES OF THE STOMACH AND OTHER DISEASES.

CONCLUDING REMARKS.

GENTLEMEN,—The relations in which the disorders of the stomach stand to other diseases are, as I need scarcely say, of the greatest importance. There is scarcely an internal ailment which is not more or less connected with gastro-intestinal digestion and with functional disorders, the treatment of which consists in the earlier described measures. But we are not so much immediately concerned with the disorders which occur in the course of febrile or non-febrile, localised or constitutional processes, as with the forms which depart from the ordinary type, in which gastric pains are the first symptom, or at least are to superficial observation the most prominent symptom of the pathological process, the seat of which is situated outside the stomach. It is therefore very important to determine correctly the proper causes of the digestive disorder, to distinguish the husk from the kernel, and to recognise it as such. The relations between stomach diseases and lesions of other organs from the purely anatomical point of view have been recently very well discussed by Fenwick.* Tuberculosis is the principal of these diseases, and the one which most frequently gives rise to mistakes. It is only too well known that in the course of phthisis dyspeptic disorders may occur, ranging from slight loss of appetite to severe anorexia and vomiting, and which in part go hand in hand with the course of the fever. But there are numerous cases of tuberculosis in which, as has been pointed out by Louis, Andral, and Bourdon, dyspepsia is the first symptom to attract attention.

Hutchinson † has estimated, on the basis of a large amount of material, that 33 per cent. of all cases of dyspepsia are really the commencement of tuberculous diseases. Marfan * holds that these high figures are exaggerated, and quotes a remark of Quenu, approved by every experienced practitioner, that many patients fail to observe a period of dry cough which precedes the occurrence of expectoration, so that in truth we must antedate the beginning of phthisis, the statements of the patient making it too recent. In sixty-one cases of phthisis he has found only five in which gastric disorders preceded the outbreak of the lung affection. Meanwhile we are not so much concerned with the history of cases as with the fact that we are repeatedly consulted by patients complaining only of stomach disorder, and regarding this as the source of their indisposition, who on careful examination are found to possess either undoubted signs of phthisis, or a suspicion is aroused, which in the further course of the disease is verified.

---

* S. Fenwick. Zusammenhang zwischen Magen- und Organerkrankungen. Virchow's Arch. Bd. 118, p. 2.

† Hutchinson. The morbid states of the stomach and duodenum. London, 1878.

Such patients, generally slenderly built, somewhat anæmic persons, begin to complain of failing appetite, oppression and fulness after eating, with irregularity of the bowels. They suffer from eructation and bad taste in the mouth, they feel low and exhausted, and are frequently treated for a long time for chronic gastric catarrh. Both physician and patient are surprised that the apparently very rational means employed remain without any influence, until a careful examination permits the beginning of a lung affection to be recognised, or at least to be suspected. Without there being any recognisable dulness, the apices do not expand well, or on one entire side the respiration lags a little; the respiratory murmur has a soft, moist, sipping character; the movement of the entire thorax is insufficient, inspiration and expiration when measured by the manometer are shown to be feeble; expiration is prolonged. If we inquire more closely we find that the patient has "hawked" for a long time without paying any attention to it, that he has had scrofula as a child, that he has perspired easily without having had actual night sweats, and that there is some hereditary predisposition. If you can obtain some sputa—and frequently the patients do not think of it, as they expectorate so little, or swallow their sputa—a few scattered bacilli will be found, and the diagnosis is at once established. In

---

* Marfan. Troubles et lésions gastriques dans la phthisie pulmonaire. Paris, 1887.

such circumstances no doubt a stomach disease is present, but it is the outcome of venous hyperæmia and stasis, which in their turn are the results of disordered pulmonary circulation. It is worth while to test the chemical condition of the stomach in phthisis. C. Rosenthal, Klemperer, Schetty, O. Brieger, Hildebrand, and Immermann * have carried out methodical examinations of this kind, following earlier experiments (Edinger, Ewald), and have come to nearly identical results, which may be given in the words of Brieger: "In cases of severe phthisis the chemical condition was normal in only 16 per cent., whilst in the others there was more or less insufficiency, and in 9·6 per cent. complete disappearance of the normal products of secretion could be demonstrated.

"In moderately severe cases the gastric juice was normal in 33 per cent., in all the others there was, more or less generally, considerable disturbance, which in 6·6 per cent. amounted to complete disappearance of the normal products of secretion.

"In the commencing stage there were as many cases with normal secretion as cases with disorders of it."

Absorption and motor power appear to be affected in proportion to the disturbance of the chemical functions.

Of course these percentages, which were based on sixty-four cases, do not give an absolute, but only an approximate standard for the conditions in question.

With more material, longer observations, &c., they may easily be superseded, as Rosenthal in his researches at the Augusta Hospital, which certainly were only published as a preliminary communication, occasionally found well-marked cases without free hydrochloric acid; Hildebrand never found free hydrochloric acid in phthisis with continued fever, whilst Klemperer and Immermann observed advanced cases with free hydrochloric acid present, and even some with hyperacidity (in the initial stage of phthisis). Immermann, moreover, found the motor function of the stomach without decided alteration in fifty-three out of fifty-four cases, that is, the stomach was empty six hours after Leube's test meal, while Klemperer with his oil method

---

* C. Rosenthal. Ueber das Labferment. Berl. klin. Woch, 1888, No. 45.—Klemperer. Ueber die Dyspepsie der Phthisiker. Ibid. 1889, No. 11.—Schetty. l.c.—O. Brieger. Ueber die Functionen des Magens bei Phthisis pulmonum. Deutsche med. Wochenschr, 1889, No. 15.—Immermann. Verhandl. d. Congr. f. innere Med. Wiesbaden, 1889.

(v. page 266) discovered a distinct enfeeblement of the motor power of the stomach. Certainly the almost constant discovery of hydrochloric acid by Immermann, who found it thirty-eight times out of forty-four examinations, even when there were high fever and cachexia, and even in the terminal stages of phthisis, in opposition to the 33 per cent. of Brieger, must be attributed to the use by Immermann for his purpose of Jaworski's test breakfast (the albumen of two hard-boiled eggs and 100 ccm. of water). At the same time these examinations give us some valuable data, and would have done more if the observers had laid more stress on the relation between the patient's subjective disorders and the objective facts. The so-called dyspepsia of phthisis is doubtless not caused by a localisation of the tubercular process in the gastric mucous membrane, but as already stated is a complication caused by disorders of the conditions of the circulation. But it is just as little to be doubted that a very great part of the results of the treatment of phthisis depends on the nutrition of the patient and his capacity for being nourished. The super-alimentation of the French, and the experience of Dettweiler, Peiper, Rühle, Liebermeister, Leyden, &c., are the best proof of this. We shall pursue this side of our treatment with much greater energy if we are guided by a chemical examination of the functional capacity of the stomach, that is, independent of the subjective complaints of the patients. Though the treatment must be directed to the fundamental condition, with the improvement or cure of which the dyspeptic disorder will disappear, yet it must not be overlooked that an improvement of the functions of the stomach, and therewith of the nutritive condition, must react favourably upon the local processes in the lungs. Specific stomach remedies are futile, if not mischievous, because they irritate and increase the hyperæmia of the mucous membrane, in which there is already defective circulation. It is much more desirable to diminish the irritation of food on the mucous membrane as much as possible, that is, to use light diet, and in each case in which digestive disorder suggests its necessity to test according to rule the functions of the stomach. A general rule obviously cannot be laid down for the latter, as it is clear *a priori* that this can only be done by careful estimation of the various factors. Rosenthal has found in the same patient during the summer no free hydrochloric acid present at repeated examinations, while in the winter, when examined many times at the Augusta Hospital, large quantities of free acid were present, and Hildebrand has observed the same variations in short spaces of time. Only this much is certain, the subjective sensations of the patient do not always coincide with the results of objective examination, and therefore they must not always be allowed to be a counter-argument for treatment which has for its aim to improve the nutrition of the patient by increased feeding (alimentation forcée of the French). With respect to milk diet, in the above described cases or stages with hyperacidity it is important to bear in mind the action of milk in fixing acids.

But after this digression from our starting point, to return to cases of pretubercular dyspepsia, if we may use this incorrect expression, they are easily recognisable with sufficient attention. The diagnosis is not so simple if there is central miliary tuberculosis with slight febrile movement and corresponding dyspeptic symptoms. If there is slight swelling of the spleen, which is either recent or of old standing, there is much risk of confounding it with ambulatory typhoid. Not long ago a gentleman from St. Petersburg consulted me, who regarded himself as a dyspeptic, but in whom this condition was present. He had slight irregular fever with moderate evening exacerbations, which may have already existed some time, as he had been ordered quinine, antipyrin, and hydrochloric acid. As he apparently had been taken ill a few weeks before, after a journey into a part of the country where there was fever, but nevertheless had been actively engaged in business and was not confined to bed, it was possible to think that it was the final stage of ambulatory typhoid with a remittent temperature, until in the course of about four weeks the undoubted symptoms of acute miliary tuberculosis appeared.

Cardiac defects constitute the second group of diseases in this class. Here also from the nature of the process we get venous stasis in the stomach, and the symptoms of chronic catarrh. Careful examination first reveals a valvular defect and enlarged heart, a latent pericarditis, or the signs of adherent pericardium, or chronic myocarditis. Such cases, which as I again insist can be only in their initial stages, the treatment of which is well understood, allow the physician momentarily, unfortunately not permanently, to congratulate himself on his therapeutic results, as frequently, after a short use of digitalis or similar means, the catarrhal symptoms completely disappear and a period of absolute or relative health is secured.

Renal diseases also belong here, when they give rise early to retention of the excretory products of the organism, which then pass into the stomach and intestine and set up irritation. In such doubtless rare cases vomiting and the signs of disordered gastric digestion occur, often long before the presence of distinct dropsy or other symptoms leads to a correct diagnosis, and appear to be an independent affection, whilst they are in truth only the expression of chronic uræmia; sometimes even this may occur when, without any disease of the renal parenchyma, a persistent retention of urine results from obstruction in the urinary passages, while renal tumours, especially carcinoma of the kidneys, may for a long time, as the case recorded by Colleville* proves, only give rise, even up to death, to disordered digestion, loss of appetite, vomiting, and emaciation. But the kidneys may also, without any injury to their properties as secreting organs, by abnormal positions or mobility, cause changes in the stomach, disorders of its functions, and painful sensations, which have already been discussed under dilatation of the stomach and gastralgia.

Founded upon the intimate relation between the liver and stomach is the circumstance that profound disorders of function of one organ almost without exception react upon the other, but it is directly on account of this intimate dependence, and on account of this circumstance, that so many injurious influences introduced from without affect both organs at the same time—I would only remind you of alcohol—so that it is very difficult, if not impossible, to say which affection is primary and which secondary. For example, cirrhosis of the liver is almost invariably associated with catarrh of the stomach, yet if we find chronic gastric catarrh preceding for a longer or shorter time the doubtful symptoms of cirrhosis hepatis, we have no means of deciding whether it is a contemporaneous or a secondary disorder. But we maintain the fact to be that many cases of liver cirrhosis run a long course under the aspect of chronic catarrh, and the same is true of cancer of the liver.

* Colleville, Progr. Méd. 1883, No. 20.

We have repeatedly discussed the relations between *diseases of the central nervous system* and the stomach, and we might refrain from returning to this point. But on account of its great importance we must refer to the connection between posterior spinal sclerosis (tabes) and gastric disorders. There are not only the classical gastralgic attacks, the crises gastriques, which occur in advanced and easily diagnosed cases of tabes, but there are more undefined sensations, slight boring or snatching pains, a permanent feeling of gnawing and burning in the stomach, which occur as premonitory or early symptoms of tabes at a time when it is not characterised by typical signs. It is obvious that under such circumstances the recognition of the fundamental malady is not possible, and if the gastralgia exists for years the diagnosis may be led quite astray. This was so in a case described by Werner,* where some hardness was felt at the pylorus, which was later shown to be due to simple muscular hypertrophy, but on account of which, after the patient had been long regarded as hysterical, the operation of gastro-enterostomy was performed because it was believed that there was a constricting cicatrix at the pylorus. As the operation was without any result, the patient underwent later on Hegar's operation for removal of the ovaries, and at last, five years after the persistent occurrence of the gastric symptoms, which took the form of severe gastralgia, recognisable signs of tabes occurred, and its existence was subsequently confirmed by *post-mortem* examination. Unfortunately the early symptoms of tabes are not of a kind to permit certainty of diagnosis, and if in suspected cases we discover absence of the knee-jerk, there are known to be too many cases in which this happens apart from tabes for us to base a definite diagnosis on it in connection with gastralgia.

Amongst constitutional diseases *diabetes* is quite the most frequent cause of mistakes. Many diabetics pass for years as gastric sufferers, until an accident or some specific symptom, emaciation, pruritus, polyuria, polyphagia, dental caries, visual disorders, &c., leading to an examination of the urine, brings about the diagnosis.

The relations between *gout* and digestive disorders are extensively treated of in English literature. According to some authors a specific gouty stomach disorder, in consequence of the uric acid diathesis or poisoning with the products of incomplete tissue metamorphosis and defective excretion, gives rise to a "disturbed retrograde metamorphosis." Thus Burney Yeo* among the most important symptoms of gout includes the various forms of dyspepsia. Other authors, such as Brinton, Pavy, and others, do not recognise a specific gouty disorder of the stomach, and according to our view they are right. As with the gouty so with the *rheumatic diathesis*, which plays a great part in French literature. Whilst it has been completely absent in many cases of true gout, my cases of chronic rheumatic arthritis have been repeatedly associated with dyspeptic disorders, which were so severe that the joint pains yielded in importance to the stomach disorder. But although there was an intimate relation, I venture just as little to decide in favour of it as of the similar relations between *cutaneous* and stomach disorders to which Pidoux † has devoted special study. Much better founded and of more practical importance are the connections between the different forms of *malarial fever*, the declared and latent intermittent fever and *typhoid* diseases, especially ambulatory typhoid, with digestive disorders. Malarial infection gives rise to intermittent cardialgia (Leube ‡) or various neuroses of the stomach, which appear with a certain regularity (Rosenthal, Glax §), for the treatment of which, according to the experience of Glax, so long as the patients remain in the malarious district, quinine alone is of any use. Kisch || at Marienbad and Glax at Rohitsch have observed that under the use of the waters of those places the attacks became actually intermittent, and finally disappeared. At one time we had not infrequently the opportunity in Berlin of treating such latent cases of malarial dyspepsia.

---

* G. Werner. Gastrische Krisen als Initialsymptom einer Tabes dorsalis. Inaug. Diss. Berlin, 1889.

Gentlemen, in the course of these lectures on diseases of the stomach we have spoken with special reference to the experience yielded to us by the novel methods of examination, chiefly of the chemical functions of the stomach, and we have been able

---

* Burney Yeo. On the treatment of the gouty constitution. Brit. Med. Jour., 1888, Jan. 7 and 14.

† Pidoux. Rapport de l'herpétisme et des dyspepsies. Union méd., 1886, No. 1.

‡ Leube. Beiträge zur Diagnostic der Magenkrankheiten. Deutsches Arch. f. klin. Med. Bd. 33.

§ Glax. Ueber die Neurosen des Magens. Wien, 1887, p. 206.

|| l.c.

to combine better known nosological facts with recently acquired diagnostic and therapeutic data. It remains for us to examine the question of the position occupied by the method of chemical examination in the diagnosis of diseases of the stomach, and to inquire how far it permits definite conclusions to be drawn as to the nature of the disorder present. Are the disorders of function which we discover with the help of the sound and test-tube specific and characteristic, in the sense of belonging exclusively and only to a definite form of disease and absolutely diagnostic, like tubercle bacilli in the sputa, or hyaline casts in the urine, or are they signs of more general meaning, having nothing to do with a specific morbid process? You know, gentlemen, that recently some have gone so far as to divide diseases of the stomach into those with increased secretion, those with diminished, and those with totally absent secretion of hydrochloric acid, and perhaps some of you have regretted that in order "to be quite in the fashion" I have not so arranged our subject. This would be as foreign to my ideas of what is right as if I were to write a text-book of special pathology, and were to classify diseases according as they occur with or without dropsy, with or without jaundice, with or without albuminuria, &c. If we abstain from exaggeration, and keep to the solid ground of facts, we can draw the following conclusions from our present experience.

There are two great groups of chemical results which depart from the normal conditions of the stomach: first, the untimely presence of organic acids; secondly, changes in the proper gastric juice, the secretion of hydrochloric acid, pepsin, and rennet ferment, and the absorption and movement of the organ.

The organic acids, above all lactic acid, are, if they occur during a stage of digestion in which, as you know, we do not meet with them normally, always characteristic of a definite pathological process, giving rise to subjective sensations in the patient, and depending on abnormal processes of putrefaction or fermentation, the causes of which are manifold, but are always connected with a morbid condition, as they are not only an abnormal chemical result, but they give rise to more or less violent pains in the individual affected. In this lies the importance of the demonstration of lactic and fatty acids, to which it is no prejudice to have shown that small traces of lactic acid are present throughout the whole duration of normal digestion, any more than the existence of traces of sugar in the normal urine impairs the diagnosis of diabetes. As these fermentative products are always associated with an abnormally long duration of the ingesta in the stomach, generally with an absolutely or relatively diminished production of hydrochloric acid, we are able in this way to come to a precise diagnosis.

The conditions are much more complicated when we attempt to estimate the changes of the specific gastric secretion. As the relation of the secretion of pepsin and rennet goes hand-in-hand with that of hydrochloric acid—excepting slight, not generally serious variations—so the course of the hydrochloric acid secretion may serve as an example in the following remarks.

I am of opinion that the secretion of more or less hydrochloric acid is a phenomenon which stands so far in relation with the different morbid types, as that some have a distinctly greater tendency to increased secretion, while others are more disposed to diminution or complete failure, but still only in proportion as the different morbid processes are attended by anatomical or functional disorders, which naturally necessitate an alteration of the production of hydrochloric acid, so that it quite depends on the extent of these factors in the course of a disease how far the secretion of acid is to be attributed to them. Certainly we may say that one definite group of disorders never gives rise to increased secretion, particularly all those forms in which an extensive organic destruction or change of the secreting glandular epithelium is present. At least we do not know of any vicarious increase of secretion on the part of the remaining gland cells. To this category belong cancerous degeneration, chronic gastritis with its consequences, atrophy of the mucous membrane, mucous degeneration of the gastric glands, and perhaps certain chronic vascular degenetions, such as amyloid degeneration, for example. There is some evidence, and further investigation may make it clear, that other chronic debilitating diseases, such as profound anæmia, tuberculosis, valvular defects, diabetes, and similar morbid conditions may stop the secretion of free acid. But if we invert this proposition, and proceed to say that certain forms of disease give rise to increased secretion, we should be going too far. Increased secretion is always a functional symptom, a symptom of irritation. But every such over-production can, as is well known, be changed to the opposite, I mean not only as an effect of exhaustion after previous over-excitation, but *ab initio* as a symptom of depression. So that we may occasionally meet with a condition which ordinarily tends to be associated with strong irritation of the secreting elements, such as ulcer of the stomach, without this. In the same way a neurosis may so present itself occasionally, that an excess of acid is produced (hyperacidity) only during the work of digestion proper, on another occasion there is permanent secretory irritation with resulting hypersecretion. But there are also cases in which there exists a relaxation and diminution of secretion of such a kind that the hydrochloric acid is reduced permanently to a minimum. As such cases, so far as I know, have not often been published, it may be of interest to relate one. Mr. K. is an actor, aged twenty-eight, slenderly grown, without demonstrable organic disease, and with a good history. He was formerly always healthy, and had always lived very steadily and moderately. In the winter of 1884 and 1885, his work at the theatre was very severe, as he had to appear many hundred times in succession in the same exhausting part. He felt himself overworked and dull, and in the course of the next summer he fell into the condition which he described as follows: "It seemed to me as if my entire abdomen were tied up with a rope so as to cause a sudden terrible oppression, which extended as far as the upper part of the chest, and caused me tormenting difficulty of breathing. I could not take full and deep breaths, as I had an unpleasant sensation of fulness in the abdomen. Even when I had eaten nothing—for example, on waking early—the condition was not in the least diminished. I cannot complain of actual pain; but since this came on I have never felt well. The weight in the abdomen and the oppression are always there to remind me that my health is not sound. Whilst I frequently had a large appetite and enjoyed my food, there occurred not only after meals but even during eating violent dyspepsia combined with endless eructation and belching, as well as great heaviness; originally too there was vomiting, which, however, did not return after some few times. To these were added a quite sudden polyphagia, after the disappearance of which the above-described dyspepsia did not leave me. The remedies employed by our family physician produced no effect, and this condition continued till the winter of 1886. At that time the discovery that I had a tapeworm made me hope that on its expulsion improvement would follow. However, the evil was as bad as before, if not worse. My strenuous exertions in the winter of 1886—87 did nothing to diminish it. Since then my whole body has been dominated by great heaviness and lowness; and in spite of complete rest and nursing, as well as the most careful diet, it has not yielded. There remains the sensation of an excessive fulness in the abdomen, as well as the oppression (often also stitch in the side) and want of breath. However, I have had through it all a good appetite, even a large one; I enjoy my food, but after meals I get generally, not always, more or less nausea."

I have had this gentleman under treatment for more than three years, and have tested his gastric juice during this time more than thirty times for hydrochloric acid, and indeed in every way both after the test breakfast and after full meals. During the whole of this time only a small quantity of free acid could be demonstrated on three occasions. Propeptone was regularly present in relatively great quantities, whilst the peptone reaction was only slight and the digesting power of the stomach filtrate, without further addition of hydrochloric acid or pepsin, failed completely except on two occasions. The rennet ferment action was observed to be present in half of all the examinations, and even when the free hydrochloric acid failed, but at the same time lactic acid was present, whilst sometimes only lactic acid and peptone-reaction could be observed, free hydrochloric acid, pepsin, and rennet being absent. Great quantities of mucus were never present in the water with which his stomach was washed except on the first occasion, when the patient had obviously swallowed great quantities of mucus from the irritation of the tube; on the other hand, on two days we found little shreds which did not resemble the ordinary mucous shreds, inasmuch as they sank rapidly in the water. They consisted of the above figured (fig. 18, p. 404) epithelial scales of the gastric mucous membrane. I hold this to be certainly pathological, but I believe that such desquamations from the gastric mucous membrane, as well as from other mucous membranes, occur continually, and are only not ordinarily found because the acid gastric juice digests the cells. The patient, after he had first taken strychnine in small doses, was benefited by having his stomach washed out and douched every other day. In this case it was certain that mucous catarrh was not present. Atrophy of the mucous membrane was equally not present, as this only develops as a consequence of persistent catarrh and at a more advanced age. There was no evidence of cancer, so that there was nothing left but to accept the view that we had to do with a neurosis. In fact the patient died this year (1891) by suicidium in an attack of melancholia, all his gastric complaints disappearing some six or eight months before.

To the same category belong the cases examined by Dr. Wolff of Gothenburg and myself in 1887, at the infirmary for females in this city, with reference to the condition of their gastric juice. We discovered to our no small amazement that free hydrochloric acid was persistently absent in a number of persons who had no dyspeptic pains. I have now had those same persons re-examined by Dr. Sandberg of Marstrand, and the condition has been found to be for the most part unchanged, while in some of them hydrochloric acid could be discovered. Here there could scarcely be any question of a neurosis; but what is this remarkable and latent disease which can so seriously derange the ordinary functions of the gastric glands? We cannot accept the view that there is any degenerative disease of the mucosa, as in some of them at times there were intercurrent returns of free hydrochloric acid, and I have observed these women for years without seeing any sign of stomach trouble, as must have undoubtedly been the case had that been so. Dr. Grundzach * has come to the conclusion from similar observations that "the mechanism of the stomach performs its function quite sufficiently, or is extremely little disturbed in spite of the complete cessation of secretion." I have in addition, on the occasion of the examinations described on p. 551, respecting the action of Carlsbad water, examined a young, healthy hospital nurse, aged 28, who digested well for a period of nearly two months, and I found regularly quite abnormally small quantities of acid, which in the absence of any complaint of stomach disorder, I attributed to an anomaly of secretion.

---

* J. Grundzach. Ueber nicht carcinomatöse Fälle von gänzlich aufgehobener Absonderung der Magensäure resp. des Magensaftes. Berl. klin. Wochenschr. 1887, p. 543.

Finally, gentlemen, please remember the great differences which we have found in the daily acidity of the same individual, amounting to 27 cm., reckoned by one-tenth normal soda solution to 100 gastric juice. In truth our methods are insufficient, they are too coarse, and give us certainly no information respecting a number of minor alterations of the chemistry of digestion. The normal process of digestion doubtless takes place with copious secretion of hydrochloric acid, which not only gives rise to many chlorine compounds that may be formed with certain food, but there is an overplus of free acid present, which seems to be indispensable to the course of regular stomach digestion. Yet we should not forget that, as I showed long ago, in the digestion of albumen,* peptonisation, though slight, may occur without proper free acid being present even under normal circumstances, namely, during menstruation, where no free acid, or only very small quantities are secreted, and that the human organism obviously possesses the capacity in no slight degree of compensating for the defect of the secretion of hydrochloric acid and its associated peptic and rennet action, by transferring the chyme more rapidly into the bowel and subjecting it to digestion in the intestine.

After all this you will agree with me if I do not generally base any urgent conclusion on the bare fact of a higher or lower or apparently normal acidity, provided that this is not due to any other acid than hydrochloric acid, but regard such results only as very important contributions to the completion and recognition of general symptomatology. I must not be misunderstood, and expressly insist that I by no means intend to diminish the value of our investigations—on the contrary they are indispensable, and we feel ourselves in all cases uncertain and off solid ground if we have not carried them out in detail. You find, gentlemen, in every point of our discussion proof of how much medical knowledge has been widened and deepened by these new methods of investigation. But many things at the present time unite to forbid any one-sided exaggeration of their value. Only the most careful and thorough consideration and weighing of *all the symptoms of disease* by *all diagnostic means*, can permit us to recognise the nature of the disorder present. In the closest investigation of the chemical fur of the stomach we do not possess a magic rod by wh conjure from the hard rock of obscure symptoms the clea spring of knowledge. The old words are still as true as e

---

* C. A. Ewald. Ueber den "Coefficient de partage" und über das Vorkommen von Milchsäure und Leucin im Magen. Virchow's Archiv, Bd. 90, p. 349.

> "Uti ratio sine experimentis mendax,
> Ita experimenta sine ratione fallax."

INDEX.

Abelmann, 154, 158, 159.
Abercrombie, 290, 449.
Absorption, 180, 562 ; mechanism of, 183, 191 ; of fat, 184 ; seat of, 193 ; of sugar from the stomach, 193 ; of peptone from the stomach, 194 ; from large intestine, 194 ; estimation of rapidity of, 258 ; by the gastric mucous membrane, 262.
Acetic acid, test for, 246.
Acidity of the chyme, 124 ; of the stomach, 237.
Acids, post-mortem action of, 208 ; fat and fatty, 208 ; organic, 244.
Acker, 82.
Acoria, 616.
Adamkiewicz, 88, 156, 184, 197.
Adamkiewicz peptone, 194.
Adelomorphic cells, 61.
Agarophobia, 529 ; treatment of, 547.
Air, inflation of the stomach and intestine with, 268.
Air, influence of mountain and country, 648.
Alberts, 369, 371, 372.
Albumen, digestion of, 252.
Albumen glands, 34.
Albumen in the lacteals, 197 ; ordinary, 206 ; as milk, 207 ; in the form of meat, 207.
Albumen, splitting up of, 89 ; reconversion of peptone into, 197.
Albuminate of iron, 643.
Albuminates, hydrates of, 89.
Albumoses, characters of, 83 ; classification of, 83.
Alcohol, influence of, 95 ; test for, 247.
Alcoholic fermentation, 20, 109.
Alimentation forcée, 653.
Alkalies, influence of concentrated solutions of, 95.
Alkaline fermentation, 526.
Alkalinity of the urine, 75.
Allbutt, 226, 324, 555.
Aloine, subcutaneous injections of, 359.
Alt, 621, 622.
Amidic acids, formation of, 109.
Amphopeptone, 86, 149.
Amylolytic action of the saliva, 46.
Anacidity of gastric juice, 617.
Anadenia of the stomach, 518, 521, 532.
Anæmia, pernicious, 393 ; in ulcer of the stomach, 435 ; progressive, 483.
Analysis of the bile, 127 ; of diarrhœic stools, 177.
Anatomical changes of chronic gastritis, 514.
Andral, 372, 382, 504, 635, 649.
Aneurisms, small, 483.
Anhepatogenous jaundice, 135.
Aniline red, 239.
Animal heat as a combustion process, 6.
Anodynes, 421, 471.
Anorexia, 588 ; case of hysterical, 646.
Anrep (v.), 123, 180.
Anthropocholic acid, 132.
Antideutero-albumose, 83.
Antifermentative action of bile, 138 ; of hydrochloric acid, 547.
Antifermentative remedies, 546.
Antifermentative solutions, 360.
Anti-albumide, 83.
Anti-albuminate, 82.
Anti-peptone, 148.
Antiperistalsis, spontaneous, 169.
Antiperistaltic restlessness, 615.
Antrum pylori, 123.
Antweiler's albumoses, 194.
Aperients, vegetable, 422, 549.
Appetite, 390, 576 ; caprice, 577 ; causation of appetite, 578 ; morbid, 585.
Ardor ventriculi, 525.
Aretæus, 583.
Aristotle, 19.
Arloing, 35, 36.
Arnold, 619.
Arnott, 220.
Arsenic, 474.
Asp, 529.
Asparaginic acid, 150.
Astaschewsky, 44.
Asthma dyspepticum, 528, 610.
Atmospheric germs, 24.
Atony of the stomach, 526, 624.
Atrophy, acute yellow, 481.
Atrophy of the mucosa, 517.
Auerbach, 560, 627.
Aura vertiginosa, 529.
Avelli, 196.

Bacteria, action of, 109.
Bacterium ærogenes, 103.

Balneology, 554.
Bamberger, 320, 338, 395.
Baraduc, 276.
Barras, 555, 583, 613.
Bartels, 335, 533.
Barth, 14.
Bartolinus, 127.
Bary (de), 108.
Baryta-peptone, 85.
Basch (v.), 167, 529.
Bastian, 23.
Bauer, 190, 194, 195.
Baum, 362.
Baumann, 8, 173, 174.
Bayer, 132.
Beau, 374, 555.
Beaumont, 99, 111, 432, 489, 495, 544.
Béchamp, 18.
Bechterew, 49.
Becker, 12, 183.
Beer, influence of, 95.
Behrens, 269.
Belladonna, 421.
Bellamy, 18, 19, 20, 21.
Beneke, 30, 648.
Benzoic acid, 360.
Bergrün, 168.
Bernabel, 331.
Bernard, 2, 4, 32, 48, 63, 105, 106, 144, 145, 146, 147, 153, 154, 186, 196.
Bernstein, 146, 529.
Berthelot, 73.
Berthold, 440.
Bertz, 19.
Betz, 167.
Beyer, 35, 44.
Bidder, 1, 49, 68, 69, 94, 137, 138.
Biedert, 207.
Bikfalvi, 95.
Bile, influence of, on gastric digestion, 95; analysis of, 127, 130; formation of, 128; description of, 128; quantity of, 129; action of drugs on secretion of, 129; diastatic capacity of, 130; acids, 131; mucus of, 131; Plattner's crystallised, 131; sulphur of, 132; pigments, 133; acids in normal urine, 133; action of, 137; anti-fermentative action of, 138; circulation of, 138; pathological changes in, 141; taste of, 497.
Bile-ducts, reflex contraction of, 129.
Biliary fistulæ, 127.
Bilifuscin, 134.
Bilin, 553.
Biliprasin, 133.
Bilirubin, 133; crystals, 134.
Biliverdin, 133.
Binswanger, 644.
Bird (Golding), 393, 397.
Bismuth, 475.
Bismuth, salicylate of, 358.
Bitter infusions, effect of, 96, 541.
Bizzozero, 35, 164.
Blatin, 220.
Blondeau, 529.
Blondlot, 93, 127, 206.
Blood, constitution of, 382; condition of, in cancer, 392; amount of potash in, 441.
Blums, 482.
Boas, 68, 69, 70, 71, 77, 83, 84, 91, 95, 124, 170, 172, 202, 203, 204, 225, 226, 230, 236, 239, 243, 244, 247, 248, 250, 255, 259, 401, 524, 541, 552, 615, 622, 637.
Bocci, 275.
Boerhaave, 372.
Bokai, 168.
Boll, 33.
Bouchard, 110, 325, 353.
Bougies, 307.
Bouilleaud, 457.
Bourdon, 649.
Bourget, 126.
Bourneville, 619.
Boussingault, 20.
Bowels, action of, 392.
Bozemann, 157.
Braam-Houckgeest, 167, 339.
Brachet, 559.
Braun, 541.
Breakfast, test, 232.
Brensing, 48.
Brieger, 11, 21, 173, 174, 176, 192, 651, 652.
Bright, 157, 159.
Brinck, 198.
Brinton, 278, 292, 368, 373, 375, 377, 381, 382, 383, 384, 389, 390, 392, 403, 440, 453, 504, 506, 514, 656.
Briquet, 582, 616, 629.
Bristowe, 609.
Bromine water, Erlmeyer's, 642.
Broussais, 594.
Brown, 172, 594.
Brück, 529.
Brücke, 93, 104, 137, 191, 197.
Brunner, 126, 157, 362.
Brunner's glands, 163, 165.
Brunton (Lauder), 486, 497.
Buccal glands, 45.
Buchheim, 96.
Buchner, 21.
Budd, 448, 454, 456, 470, 481, 548, 555, 604.
Budge, 165.
Bufalini, 160.
Bulimia, 585.
Bunge, 89, 110, 171.
Burkart, 94, 203, 275, 632, 644, 645, 646, 647; his painful pressure points, 596, 629.
Burns, relation of, to ulcer of the stomach or duodenum, 439.

Busch, 125, 212.
Bush, 220.
Butyric acid, test for, 173, 246.
Butyric fermentation, 109.

Cachexia, cancerous, 386, 410.
Cahn, 74, 115, 235, 246, 248, 256, 320, 340, 350, 351, 397, 400, 437, 438, 615.
Cahours, 14.
Calculi, gastric, 584.
Callow, 507.
Camerer, 439.
Cancer of stomach, 94 ; ætiology of, 368 ; statistics, 368 ; heritability of, 369 ; origin of, 371 ; morbid anatomy of, 374 ; varieties of, 375 ; teleangiectatic, 376 ; melanotic, 376 ; mixed forms, 376 ; localisation of, 376 ; ulceration of, 382 ; symptoms of, 383 ; duration of, 389 ; colloid, 390 ; pain in, 390 ; diagnosis of, 393, 413 ; latent, 414 ; relations of ulcer to, 415 ; treatment of, 417.
Cancerous growths, 329 ; metastases, secondary, 380 ; cachexia, 386, 410.
Cane sugar, digestion of, 114.
Canstatt, 220, 379.
Cantani, 159.
Canula, permanent, 304.
Caragiosiadis, 275.
Carbolic acid, influence of, 95, 358.
Carcinoma, medullary, 376 ; colloides, 376 ; villosum, 376.
Cardia, symptoms of stenosis of, 277 ; case of, 281 ; causes of, 287 ; dyspnœa in, 298 ; treatment of, 302, 307 ; dilatation of, 302 ; relaxation of, 618.
Cardialgia, 525.
Carlsbad, 96 ; salt, 359, 472, 479, 553.
Carminatives, 541.
Carswell, 382, 443, 481.
Cartellieri, 609.
Cash, 172, 186, 193.
Castor oil, evils of, 548.
Casts of the stomach, 318.
Catamenia, hæmatemesis instead of, 482.
Catarrh of the stomach, 488 ; predisposition to, 490 ; changes in mucous membrane, 493 ; non-febrile and febrile, 496.
Cathartics, 359.
Catheters, Nélaton's, 227.
Cats, spontaneous antiperistalsis in, 169.
Causation of appetite, 578.
Causes of acid gastric juice, 76 ; of dilatation of the stomach, 327 ; of neuroses of the stomach, 579 ; of stenosis of cardia, 287 ; of cancer of the stomach, 368 ; of gastralgia, 590 ; of chronic gastritis, 522 ; of acute gastritis, 490 ; of hæmatemesis, 481 ; of strictures of cardiac orifice, 287 ; of ulcer of the stomach, 429, 441.
Cayman of the Orinoco, 207.
Cazeneuve, 25.
Cells, function of, 97.
Cells, gland, 60.
Celsus, 546.
Central cells, 61, 62.
Chambers, 449, 555.
Chantemesse, 440.
Charcoal, irrational use of, 547.
Charcot, 593.
Chausnes, stomach of the Duc de, 344.
Chemical theory of fermentation, 21.
Chenocholic acid, 132.
Cherchewsky, 628, 633.
Chevreuil, 140.
Chiari, 442, 522.
Chittenden, 14, 47, 81, 87, 148, 202.
Chloral, 358.
Chloride of sodium, effect of, 96.
Choleic acid, 132.
Cholephaïn, 133.
Cholepyrrhin, 133.
Cholera, hæmatemesis in, 482.
Cholesterine, 135.
Choosteck, 506.
Chyle, fat in, 137.
Chyme, 113, 115 ; reaction of, 115 ; stay of, in the stomach, 122 ; acidity of, 124 ; passage of, 125 ; contents of, 136.
Cicatrisation, 447 ; nature of, 458.
Cinnamic acid, 150.
Circulation of bile, 138.
Cirrhosis of the stomach, 514 ; of the liver, 481.
Clapotement, 325.
Clozier, 337.
Coagulation of milk, 91.
Cocaine, 358.
Codeine, 421.
Coffee grounds vomit, 385.
Cohn, 24, 71, 160.
Cohnheim, 46, 371, 379, 435, 484, 485.
Cold douches, 362.
Colin, 160.
Colleville, 654.
Combustion processes, 6.
Comby, 343, 532.
Comparetti, 555.
Compensatory cells, 60.
Composition of ferments, 14 ; of saliva, 45 ; of gastric juice, 68 ; of bile, 130 ; of gall-stones, 140.
Concretiones bezoarticæ, 584.
Condurango, 358, 417.
Congo paper, 247.
Congo red, 238.
Constipating effect of morphine, 170.
Constipation, chronic and inveterate, 338.
Contents of the stomach, 234.
Contraction of the pylorus, 333.
Cooks, gastric ulcer in, 433.
Cooper, 439.

Copland, 604.
Cordes, 529.
Corvisart, 94, 147.
Cough, stomach, 527.
Country air, influence of, 648.
Crackling sound, 325.
Cramps, muscular, 352 ; stomach, 614.
Creosote, 358.
Crescents, 34, 35, 59.
Crises, gastric, 593.
Crisp, 435.
Cruveilhier, 331, 429, 446, 447, 454, 504, 521.
Crystals, bilirubin, 134 ; hæmatoidin, 134.
Cullen, 525.
Cumming (John), case of, 432.
Curling, 439.
Cynorexia, 585.
Czerny, 112.

Daettwyler, 431.
Danilewski, 88.
Darwin, 619.
Daumann, 636.
Davidson, 94.
Debove, 482.
Decker, 126.
Deglutition, 54 ; sounds of, 56 ; as a diagnostic means, 270.
Dehio, 322, 621.
Deininger, 506, 507.
Dejerine, 593.
Delomorphic cells, 61, 62.
Demange, 593.
Demant, 171, 213.
Demonstration of organic acids, 244.
Dettweiler, 652.
Deutero-albumose, 83.
Dewitz, 35.
Diabetes and the pancreas, 159.
Diabetic puncture, 129.
Diagnosis of chronic gastric catarrh, 534 ; of non-febrile gastritis, 498 ; of febrile acute gastritis, 499 ; of phlegmonous gastritis, 506 ; of dilated stomach, 320, 354 ; of cancer, 393, 413 ; of ulcer, 460.
Diarrhœa of children, treatment of, 170 ; tubularis, 178 ; choleraic, 178.
Diarrhœic stools, analyses of, 177.
Diastatic action of saliva, 47 ; capacity of bile, 130.
Diet, 477.
Diet system, dry, 357.
Dieterich, 94.
Diffusion of peptone, 82.
Digestion, 2 ; superficial, 2 ; interstitial, 2, 3, 4 ; in plants, 3 ; of inorganic bodies, 5 ; influence of bile on, 95 ; tables of, 98, 100 ; without the stomach, 113 ; of fat meat, 113 ; of gelatine, 114 ; of milk, 114 ; of vegetables, 114, 209 ; of gums, 114 ; of cane sugar, 114 ; of grape sugar, 114 ; in the small intestine, 127 ; trypsin, 151 ; disorders of pancreatic, 157 ; of albumen, 252 ; doubled arrangements for, 263.
Digestive fluids, relations of, to each other, 203.
Digital dilatation of cicatricial stricture of the pylorus, 362.
Dilatation of the œsophagus, 278, 297.
Dilatation of stenosis of cardia, 302.
Dilatation of the stomach, 318 ; diagnosis of, 320, 354 ; ætiology of, 327 ; its pathological appearances, 339 ; gastric juice in cases of, 347 ; treatment of, 356 ; the stomach tube the sovereign remedy, 359.
Diphtheritic ulceration, 503.
Dirksen, 57, 59.
Disinfection of the œsophagus, 311.
Dissociations-process, 22.
Dittrich, 372, 373, 380, 381, 383, 389, 504.
Diverticulum of the œsophagus, 296 ; case of, 305.
Diverticulum of the duodenum, 331.
Dobell, 156.
Donders, 59, 167.
Doubled arrangements for digestion, 263.
Douches, 362, 640.
Dragendorff, 133, 139.
Drasch, 165, 181.
Drastic purgatives, 359.
Dreschfeld, 395.
Drinking, 31.
Drinks, 206, 424.
Dropsy, 388.
Drugs, action of, on secretion of bile, 129.
Du Barry, 344, 345.
Ducasse, 621.
Dujardin-Beaumetz, 110, 325, 358, 538, 547.
Dukes, 61.
Dumas, 14, 19.
Dunglison, 451.
Duodenum, diverticulum in the, 331 ; ulcer of, 439.
Duplay, 359.
Dupuytren, 439.
Duration of cancer, 389.
Dusart, 276.
Dusch, 23.
Düsterhoff, 95.
Dysalbumose, 83.
Dyspepsia cardiaca, 528 ; flatulenta, 628 ; uterina, 637 ; pretubercular, 653.
Dyspepsias of nervous origin, 112, 625 ; reflex, 112.
Dyspnœa in stenosis of the cardia, 298.

Eberle, 80.
Eberth, 11.
Ebstein, 60, 81, 269, 430, 493, 509, 521, 623, 624.

Edinger, 62, 104, 105, 230, 433, 493, 502, 651.
Effusions, 388.
Egeberg, 308.
Ehrmann, 167.
Eichhorst, 198.
Eimer, 182.
Einhorn, 233, 271, 273, 276, 362, 534, 622.
Eisenlohr, 393.
Electrisation of the stomach, 273.
Ellenberger, 26, 43, 46, 48, 49, 50, 77, 91, 147, 153.
Elster, 479, 600.
Ems, 553.
Emulsification of fats, 137, 185.
Emulsifying action of the pancreas, 153.
Enemata, 195, 313, 550.
Engelmann, 166.
Engesser, 154, 155.
Enzymes, 17, 22.
Eppinger, 448.
Epstein, 227.
Erichsen, 419, 439.
Erlenmeyer, 80.
Erlmeyer's bromine water, 642.
Eroding necrosis, 447.
Erosion of vessels, 447.
Eructation of inflammable gas, 348.
Eructations, nervous, 608, 618.
Escherich, 526.
Estimation of acidity, &c., 237; of rapidity of absorption, 258.
État mamelonné, 341, 514.
Ethyl-diacetic acid reaction, 353.
Etzinger, 114.
Eulenburg, 49.
Ewald (C. A.), 70, 71, 113, 124, 172, 202, 203, 250, 394, 430, 533, 556, 651. (*See also* Boas.)
Ewald (F. R.), 578.
Ewald's method of expression, 226.
Ewald's test breakfast, 232.
Exanthematic fevers, hæmatemesis in, 483.
Exercise, advantages of, 546.
Expulsive murmur, 56.
Extirpation of the pancreas, 158, 159.
Eyselein, 529.
Eysoldt, 188.

Faber, 193, 457.
Fabricius ab Aquapendente, 220.
Fæcal vomiting, 392.
Failure of free hydrochloric acid, 393.
Falk, 54, 55, 205.
Falkenheim, 344, 345.
Fall, hæmatemesis after a, 482.
Fames canina, 585.
Faradisation of the stomach, 361.
Fat, emulsification of, 137; in chyle, 137; absorption of, 184; passage of, in substance 188; as milk, 207; and fatty acids, 208; inability to eat, 585.
Fat meat, digestion of, 113.
Fat-splitting ferment, 153.
Fatty stools, 157.
Faucher, 221.
Feeding after gastrostomy, 315.
Feeding *per rectum*, 298, 312.
Fellic acid, 132.
Fellner, 168.
Females, greater liability of, to neuroses of the stomach, 580.
Fenwick, 517, 533, 555, 589, 590, 630, 649.
Ferber, 321.
Fermaud, 508.
Fermentation, theory of, 11, 21; alcoholic, 20, 109; process of, 27; lactic acid, 71; gastric, 109; butyric, 109; alkaline, 526.
Ferments, 6, 12; properties of, 13; composition of, 14; organised, 17; unorganised, 17; characters of, 19; rennet, 81, 91, 259; pancreatic, 147; fat-splitting, 153.
Fever, 386; intermittent, 432; yellow, 482; exanthematic, 483.
Fever diet, 114.
Fever, gastric juice in, 111, 502.
Finny, 454.
Fistulæ, biliary, 127; Vella's, 168, 170.
Flatow, 373.
Flatulence, 175.
Fleischer, 637.
Flügge, 22.
Fluids, digestive, 203.
Förster, 444.
Foster (Balthazar), 471.
Fothergill, 555.
Fouconneau-Dufresne, 127.
Fouquet, 616.
Fowler's solution, 548.
Fox (Wilson), 369, 435, 471.
Frank (Peter), 619.
Franzensbad, 479, 553.
Free hydrochloric acid, 69, 236; in cancer of the stomach, 94; test for, 248; failure of, 393.
Freezing, effect of, 96.
Frequency of ulcer of the stomach, 440.
Frerichs (v.), 1, 59, 62, 63, 70, 108, 114, 130, 141, 144, 146, 147, 159, 220, 267, 268, 289, 290, 345, 504, 648.
Freund, 517.
Frey (v.), 59, 186.
Friedreich, 389, 417.
Fubbini, 168.
Fuchsin, 239.
Function of the cells, 97.
Fungus hæmatodes, 376.
Funke, 82, 134, 183.
Fürstner, 275.

Gad, 137, 185, 209.
Gall-bladder, gangrene of, 506.
Gall-stones, 136, 140; chemical composition of, 140; formation of, 140.
Gallard, 483.
Gallois, 620.
Ganglion cells, 560.
Gangrene of gall-bladder, 506.
Gas, eructation of inflammable, 348.
Gas, marsh, 109, 176.
Gases in the saliva, 39; of the stomach, 103, 109; intestinal, 175; abnormal development of, in the stomach, 337.
Gastralgia, 525; treatment of, 547; causes of, 590; neurasthenic, 594; hysterical, 599; in mental diseases, 603.
Gastrectasia, 318, 358.
Gastric calculi, 584.
Gastric contents in acute gastritis, 492.
Gastric crises, 593.
Gastric digestion, influence of bile on, 95; tables of, 98, 100.
Gastric fermentation, 109.
Gastric hydropathy, 276.
Gastric juice, composition of, 68; reaction of, 69; proportion of hydrochloric acid in, 74; causes of, 76; in fever, 111, 502; secretion of, 231; in cases of dilatation of the stomach, 347; hyperacidity of, 436; nervous anacidity of, 617.
Gastric mucous membrane, absorption by, 262; granular degeneration of, 517.
Gastric ulcer, 105; production of, 106, 117; in cooks, 433.
Gastritis, chronic, 514; anatomical changes of, 514; causes of, 522; symptoms of, 523; chronica simplex, 523; chronica mucosa, 524; diagnosis of, 534; course and prognosis of, 537; treatment of, 538; acute, 489; causes of, 490; micro-organisms, 490; gastritis membranacea diphtheritica, 490; acute, gastric contents in, 492; symptoms of, 496; non-febrile, diagnosis of, 498; febrile, diagnosis of, 499; treatment of acute gastritis, 500; gastritis sympathica acuta, 501; phlegmonosa purulenta, 504; pathological anatomy of, 504; symptoms of, 505; jaundice in, 506; diagnosis of, 506; treatment of, 507; mycotic and parasitic, 507; toxica, 508; glandulosa degenerativa, 509.
Gastro-diaphane, 271.
Gastrodynia, 590.
Gastroscope, 271.
Gastroscopy, 270.
Gastrostomy, 298, 308.
Gastroxynsis, 608.
Gavaret, 382.
Gelatine, digestion of, 114; reaction of, 114; as a fever diet, 114.
Generation, spontaneous, 23.
Gerhardt, 437, 441, 453, 468, 469, 476, 508.
Gerlach, 76.
Germ theory, 24.
Gersuny, 305.
Geschleidlen, 23.
Gianuzzi, 34, 37.
Gigglberger, 99, 544.
Girdle, Neptune's, 641
Gland cells of the stomach, 61.
Glands, mucous, 34, 59; albumen, 34; submaxillary, 41; sublingual, 44; buccal, 45; labial, 45; stomach, 59; rennet, 59; Brunner's, 163, 165; Lieberkühn's, 163, 164; tubular, 164.
Glandular functions, process of, 52; innervation, 63.
Gläser, 506.
Glax, 320, 504, 615, 616, 656.
Gluczinski, 111, 395.
Glycocholic acid, 132.
Glycocoll, 131.
Glycogen in the liver, 128.
Glycosuria, relations of the pancreas to, 159.
Gmelin, 1, 115, 230.
Gmelin's test, 203.
Goltz, 64, 65, 67, 146, 166, 563, 568.
Goodsir, 344.
Gorges, 75.
Gorop-Besanez, 114, 130.
Gosse, 74.
Graaf, 144.
Graham, 77.
Granular degeneration of the gastric mucous membrane, 517.
Grape seeds, 123.
Grape sugar, digestion of, 114.
Griess, 440.
Griffini, 430.
Gröper, 187.
Groves, 525.
Grundzach, 661.
Grunewald, 99.
Grünfeldt, 442.
Grützner, 39, 48, 77, 81, 165, 493, 541.
Guipon, 587.
Guillaud, 23.
Gumilewski, 171, 196.
Gums, digestion of, 114.
Günzburg, 72, 242, 258, 439.
Gussmann, 497.

Häberlin, 193.
Habershon, 446, 504.
Hæmatemesis, 385, 392, 453, 480; causes of, 481; instead of the catamenia, 482.
Hæmatemesis in hysteria, 482; in cholera, 482; in yellow fever, 482; in scurvy, 482; in purpura hæmorrhagica, 482; after a fall, 482; in progressive pernicious anæmia, 483; in malaria, 483; in exanthematic fevers, 483.

Hæmatogenous jaundice, 133.
Hæmatoidin crystals, 134.
Hæmochromogen, 134.
Hæmorrhage, 443, 452 ; treatment of, 483.
Hafner, 482.
Hagewinkel, 538.
Haller, 571.
Hallervorden, 8.
Hamburg tea, 549.
Hammarsten, 90, 91.
Hammerbacher, 45.
Hanot, 293.
Harley, 129.
Hart (Wheatley), 297.
Hauser, 373, 443, 445.
Haycraft, 90.
Hayem, 250.
Heartburn, 513, 525.
Heberden, 538.
Heidenhain, 33, 34, 35, 36, 37, 38, 39, 41, 43, 51, 52, 59, 60, 61, 62, 77, 97, 115, 129, 145, 147, 152, 160, 164, 180, 181, 182, 183, 188, 189, 197, 443, 495, 562.
Heinecke, 362.
Heitler, 373.
Helmholtz, 23.
Hemi-peptone, 148.
Henle, 33, 443.
Hennigs, 174.
Henninger, 82, 87, 89.
Henoch, 382, 442, 481, 498, 528, 610.
Hering, 51.
Heritability of cancer, 369.
Hermann, 7.
Heron, 172.
Herth, 83, 87.
Herzen, 92, 94, 96, 538.
Hetero-albumose, 83.
Heuermann, 54.
Hildebrand, 651, 653.
Hippocrates, 583.
Hirsch, 115, 116, 235, 438.
Hoesslin, 238.
Hoffmann, 156, 489, 490, 525.
Hofmeister, 4, 26, 43, 46, 48, 49. 50, 66, 67, 77, 89, 90, 91, 123, 147, 153, 197, 625.
Höhne, 133.
Holmes, 439.
Holovtschiner, 48.
Homburg, 553.
Honigmann, 604.
Hoppe-Seyler, 6, 7, 9, 13, 14, 17, 26, 63, 71, 88, 92, 109, 111, 114, 130, 134, 191, 192, 501.
Huber, 126.
Hübner, 75, 604.
Hueter, 146.
Hufeland, 417.
Hüfner, 19, 21, 150, 151, 201.
Huizinga, 7, 23.
Hunger, 571 ; a general sensation, 571 ; contradictory theories of, 571 ; wolf, 585.
Hunger centre, Rosenthal's, 556.
Hunter, 220, 434.
Hüppe, 13, 22, 348.
Hutchinson, 649.
Hydration, 89.
Hydrochloric acid, 69, 236, 358 ; proportion of, in pure human gastric juice, 74 ; in cancer of stomach, 94 ; antiseptic properties of, 110 ; production of, 112 ; test for, 248 ; failure of, 393 ; anti-fermentative action of, 547.
Hydropathy, gastric, 278.
Hyocholic acid, 132.
Hyperacidity, 604.
Hyperacidity of the gastric juice, 436.
Hyperæsthesia of the stomach, 582.
Hyperorexia, 585.
Hypersecretio acida, 513.
Hypochondria, 583.
Hypoxanthin, 150.
Hysteria, ptyalism in, 50 ; hæmatemesis in, 482 ; neuroses of the stomach, a symptom of, 581.
Hysterical gastralgia, 599 ; anorexia, case of, 646.

Icterus neonatorum, 134.
Idiosyncrasies, 584.
Immermann, 417, 418, 420, 533, 651, 652.
Incontinence of the pylorus, 623.
Indican, 173.
Indol, 173.
Indoxyl, 173.
Indoxyl sulphate, 173.
Infarcts, hæmorrhagic, 443.
Inflammation of the stomach, purulent, 504 ; toxic, 508.
Inflation of the stomach and intestine with air, 268.
Ingesta, relation of, to pain, 451.
Injections, subcutaneous, 359.
Innervation, glandular, 63 ; of stomach, 65, 556 ; of intestine, 165.
Inorganic bodies, digestion of, 5.
Insufficiency of the stomach, 343, 367.
Insufficient nourishment, 441.
Intermission of symptoms of cancer, 388.
Intermittent sialorrhœa, 50 ; fever, 482.
Internal stomach douche, 640.
Intestinal tract, 30 ; pills, 154, 155 ; glands, 164 ; juice, 170 ; method for obtaining, 172 ; putrefaction, 173 ; gases, 175 ; polypi, 522.
Intestine, innervation of, 165 ; movements of, 166 ; emulsification of fat in, 185.
Intestines, reflexes of, 638.
Intra-molecular respiration, 20.
Inulin, 147.
Invertin, 18.
Iodoform reaction, 246.

Iron, 95, 474, 643.
Irritative conditions, 582.

Jaccoud, 616.
Jacksch (v.), 115, 249, 440.
Jacoby, 169.
Jaffé, 134, 174.
Jaundice, hæmatogenous, 133; anhepatogenous, 135; in idiopathic phlegmonous gastritis, 506.
Jaworski, 96, 113, 225, 263, 394, 473, 536, 538, 539, 541, 542, 551, 552, 604, 605, 606, 607, 652.
Johnson, 259, 583.
Jolly, 605.
Jones (Bence), 75.
Jones (Handfield), 481.
Jürgens, 627.
Jürgensen, 608, 622.

Kahler, 239, 593.
Kahn, 394.
Kalmus, 503.
Kast, 110, 174.
Katzenellenbogen, 377, 382.
Kefir, 422, 545.
Kekulé, 141.
Kemmerich, 156.
Kemmerich's meat peptone, 194.
Keratinum pepsino paratum, 155.
Kidney, movable, 336.
Kietz, 394.
Kinnicutt, 231.
Kirstein, 169.
Kisch, 637, 656.
Kissingen, 96, 263, 553, 600.
Kjeldahl, 13, 14.
Klebs, 25, 159, 493, 507
Kleef (v.), 479.
Klein, 41.
Kleist, 549.
Klemperer, 91, 126, 193, 232, 238, 259, 329, 502, 651.
Klikowicz, 95.
Klug, 164.
Knüppel, 35.
Koch, 11, 25, 106, 430.
Kocher, 309.
Kochs, 156.
Köhler, 396.
König, 232.
Koreck, 164.
Korner, 620.
Korrwin, 147.
Kossel, 87, 638.
Krauss, 123, 395.
Kretschy, 99, 125, 637.
Krishaber, 304.
Krolow, 165.
Kronecker, 54, 55, 56, 57, 58, 104.
Krukenberg, 89, 241, 395, 593.
Kühne, 17, 52, 74, 81, 82, 83, 84. 85, 87, 88, 114, 145, 146, 147, 148, 149, 150, 154, 171, 201, 204.
Kühne-Pollitzer, 90.
Kundrat, 507, 532.
Künkel, 9.
Kupffer, 493, 515.
Kussmaul, 220, 275, 319, 325, 332, 340, 344, 351, 352, 359, 363, 393, 615, 623, 625.

Laache, 392.
Labial glands, 45.
Laborde's claim for priority, 276.
Laboulbène, 510.
Lacteals, albumen in the, 197.
Lactic acid, 70; fermentation, 71, 91; test for, 73, 245.
Lambl, 633.
Landerer, 331.
Landois, 49.
Landouzy, 593.
Landwehr, 77, 185.
Lange, 381, 446.
Langendorff, 158.
Langhans, 134.
Langley, 35, 40, 43, 44, 81, 91, 205.
Lannois, 191.
Laplace, 6.
Large intestine, absorption from, 194.
Lavdovski, 35.
Lavoisier, 6, 12.
Lea, 52, 145.
Lebert, 340, 368, 370, 373, 377, 381, 382, 384, 389, 390, 392, 403, 440, 490, 496, 504, 505, 513.
Lechartier, 18, 19, 20, 21.
Ledoux-Lebard, 369.
Lehmann, 69, 70, 82, 94, 103, 133, 171, 193.
Leichtenstern, 326.
Leiter, 271.
Lemaitre, 521.
Le Nobel, 157, 158.
Leo, 227, 231, 247, 477, 588.
Lépine, 191, 239, 392.
Lesser's Atlas, 509.
Letulle, 439, 440, 482.
Leube, 77, 105, 114, 125, 194, 221, 228, 229, 233, 264, 275, 323, 435, 464, 465, 471, 473, 475, 476, 492, 507, 549, 555, 626, 629, 633, 640, 656.
Leube's solution, 194.
Leucin, 73.
Leucocythæmia, 393.
Levico, 643.
Lewaschew, 152.
Lewin, 506.
Lewy, 517.
Leyden, 304, 593, 614, 631, 644, 646, 652.
Lichtenstern, 554.
Lieben's iodoform reaction, 246.
Lieberkühn's glands, 163, 164.
Liebermeister, 358, 652.

Liebig. 6.
Liebreich, 90. 475.
Life, insufficiency of physical laws to explain problems of, 557.
Lindenberg (v.). 152, 153, 186.
Liquor pancreaticus, 155.
Lister. 22.
Litten. 353, 448, 534. 482.
Liver in digestion, 127 ; glycogen in, 128 ; cirrhosis of. 481 ; purifying function of. 487.
Liversedge. 151.
Livon. 25.
Loading the stomach, 337.
Loading theory. 92.
Loew. 14.
Loreta, 362.
Lösch. 493.
Loss of appetite, 390.
Louis, 649.
Low. 439.
Loye. 63, 275.
Lublinski, 508.
Luchsinger, 14.
Ludwig. 32, 39, 104, 112, 113, 192, 208.
Lussac (Guy). 23.
Luton. 377.
Luzzati. 168.
Lymph glands. swelling of. 382.

Mackenzie. 303, 304. 308.
Macleod. 505.
MacNaught. 525.
Magendie, 54. 125. 196, 568.
Magnus, 6.
Maier. 331.
Malachite green, 239.
Malaria, hæmatemesis in, 483.
Malbranc, 335, 640.
Malibran, 343.
Mall, 183.
Maly. 75. 76, 77, 82, 87, 134, 184, 197.
Manassein. 111, 493, 501, 502.
Mannkopff, 358.
Marcet. 432.
Marcone, 541.
Marfan, 493, 650.
Marfels, 181.
Marienbad, 553.
Marsh gas, 109 ; development of, in sewer mud, 109 ; in human flatus, 176.
Martinotti, 160.
Massage of the stomach, 276, 361, 414.
Mastication, 31.
Mathieu, 339.
Mayer, 13, 14, 167, 529.
McDowall, 106.
Meal-times, 211.
Meals, test, 232, 233.
Meat, albumen in the form of, 207 ; soluble constituents of, 208.
Mechanism of absorption, 183, 191.
Meckel, 324.
Megastria, 318.
Meissner. 9, 82, 149, 560, 627.
Melanotic cancer, 376.
Meltzer, 54. 56, 57.
Mensuration of the stomach, 326.
Mental diseases. gastralgia in, 603.
Mering (v.). 47, 158, 159, 196, 235, 248, 394. 400, 437. 438.
Merk, 155.
Merycism, 618.
Meschede, 508.
Metals, salts of. 95.
Metastases, cancerous, 380, 386.
Methyl-violet, 239.
Meyer, 12, 340, 373, 443, 521, 642.
Micro-organisms in the stomach, 108 ; in ulcer of the stomach. 439 ; in gastritis. 490.
Mikulicz, 271, 362, 597.
Milk-curdling ferment, 91.
Milk diet, objections to. 545.
Milk, digestion of, 114, 207.
Milk, Voltmer's mother's, 156 ; peptonised. 422.
Miller, 337.
Miller (v.). 108.
Minkowski, 8. 110. 135. 158. 159, 335, 338, 345, 346, 353, 358, 360.
Mintz. 248. 250.
Miquel, 110. 435.
Mislowitzer. 383.
Mitan, 546.
Mitchell (Weir), regimen of, 644, 645, 646.
Mitscherlich, 12.
Möbius, 628.
Moleschott, 181.
Montegre, 620.
Moreau, 165, 171, 192.
Morphia, 421.
Morphine, constipating effect of, 170.
Mossler, 44.
Motility, 566.
Motor activity of the stomach, 126, 262 ; salol for estimation of, 264.
Motor nerves of the stomach, weakness and paralysis of, 338.
Mountain air, influence of, 648.
Movable kidney, 336.
Movements of stomach, 64, 67 ; of intestine, 166.
Mucigen, 35.
Mucosa, atrophy of, 517.
Mucous glands, 34.
Mucous membrane, changes in, in acute catarrh of the stomach, 493.
Mucus, formation of, 35.
Mucus glands, 59.
Mucus of the bile, 131.
Müller, 1, 138, 157, 158, 187, 352, 353, 557.
Munk, 46, 172, 173, 186, 187, 189, 190, 201, 213.

Murchison, 392.
Muscle-glycogen, 208.
Muscular cramps, 352.
Muscular wall of the stomach, weakness in, 336.
Musculus, 47.
Mydriasis, 352.
Mylius, 133.

Nadina Popoff, 198.
Nägeli, 18.
Naphthaline, 360.
Napoleon family, case of, 370.
Nasse, 13, 14, 47.
Natanson, 56.
Nauheim, 553.
Naunyn, 129, 130, 133, 135 338, 360.
Nauwerk, 334.
Necrosis, eroding, 447.
Needham, 23.
Nélaton's catheters, 227.
Nencki, 6, 10, 19, 26, 139, 150, 151, 264.
Neptune's girdle, 641.
Nerve centres in stomach, 66.
Nerve fibres, secreting, 43 ; trophic, 43.
Nerves, vaso-motor, 564.
Nervous anacidity of the gastric juice, 617.
Nervous risings and eructations, 608 ; vomiting, 610 ; dyspepsia, 625.
Nervus erigens, 168.
Neuenahr, 553.
Neumann, 134, 196.
Neumeister, 84, 85, 87, 88, 89, 90, 148.
Neurasthenia and hysteria, 581.
Neurasthenia gastrica, or vago-sympathica, 625, 629.
Neurasthenic gastralgia, 594.
Neuroses of the stomach, 555 ; causes of, 579 ; greater liability of females to, 580 ; a symptom of neurasthenia and hysteria, 581 ; treatment of, 638.
Neusser, 135.
Neutral salts, influence of, 95.
Nicoladoni, 296.
Niemand, 88.
Niemeyer, 529.
Nitrate of silver, 476.
Nolte, 440.
Noorden (v.), 604, 605, 636.
Nothnagel, 157, 166, 169, 170, 174, 521, 533, 633.
Nourishment, insufficient, 441.
Nussbaum, 61, 146.
Nystagmus, 352.

Odier, 476.
Œsophagus, consecutive dilatation of, 278 ; practical hints on sounding, 283 ; diverticula of, 296, 305 ; disinfection of, 311.
Ogáta, 95, 112, 113, 193, 201.
Olefiant gas, 109.
Openchowski, 65, 66, 67.
Opium, 421.
Oppenheim, 593.
Oppolzer, 127.
Organic acids, demonstration of, 244.
Orszewcky, 419.
Orth, 507, 508.
Orthocresol, 173
Oser, 66, 221, 224, 269, 327, 555, 568, 582, 591, 593, 601, 641.
Osler, 533.
Ott (v.), 198, 406.
Over-feeding cure, 644.
Oxidation processes, 7.
Oydtmann's purgative, 550.

Pacanowski, 323.
Pacquet, 196.
Pain, in cancer, 390 ; in ulcer, 450 ; relation of ingesta to, 451.
Painful pressure points, 596.
Pal, 126, 168.
Palpation, 267.
Pancreas, 144 ; structure of, 144 ; amount of secretion, 146 ; innervation of, 146 ; emulsifying action of, 153 ; powder, 154, 155 ; pathology of, 156 ; extirpation of, 158, 159 ; relations of, to glycosuria, 159 ; relations of, to diabetes, 159.
Pancreatic digestion, disorders of, 157.
Pancreatic ferments, 147.
Pancreatine, 154 ; pancreatinum purum, 158.
Panspermism, 24.
Pappenheim, 144, 147.
Paracresol, 173.
Paralysis of the motor nerves of the stomach, 338.
Paralytic saliva, 39.
Parapeptone, 82.
Parasecretion, 605.
Parietal cells, 60, 61, 62.
Paschkis, 129.
Paschutin, 13, 47.
Passage of the chyme, 125 ; of fat in substance, 188.
Pasteur, 18, 22, 23, 25.
Pathological changes in the bile, 141.
Pathology of pancreas, 156.
Pauli, 325, 341.
Pavy, 105, 106, 196, 433, 435, 586, 656.
Pawlow, 156.
Peiper, 652.
Pemberton, 473, 538, 583, 604.
Penzoldt, 99, 115, 193, 270, 325, 326, 359, 544.
Permanganate of potassium, 360.
Pepper, 276, 362.
Pepsin, preparation of, 80 ; properties of, 80 ; pure, 81 ; action of, 252.
Pepsinogen, 81.

Peptogens. 92.
Peptone-albumose, preparations of, 194.
Peptone, diffusion of, 82; Lehmann's, 82; characteristic reactions of pure, 84; in substance, 85; preparation of pure, 86; composition of, 87; physical properties of, 87; characters of, 89; Adamkiewicz's, 194.
Peptone, toxic effect of, 90; bitter taste of, 90; formation of, in stomach, 116; absorption of, from stomach, 194; reconversion of, into albumen, 197; meat, 422.
Peptones are hydrates of the albuminates, 89.
Peptonisation, 82, 86.
Peptonuria, 353.
Perewoznikoff, 189.
Perforation, 447, 455.
Peristaltic restlessness, 615.
Peristaltic agitation of the stomach, 351.
Pernicious anæmia, hæmatemesis in, 483.
Pertik, 331.
Petit, 80.
Pettenkofer, 46.
Pettenkofer's reaction, 132.
Peyer, 586.
Peyer's patches, 163.
Pfeffer, 20.
Pfeiffer, 47, 95, 551.
Pflüger, 6, 7, 22, 33, 36, 37, 49, 167.
Pfungen (v.), 68, 122, 123, 437, 477, 530, 606, 625.
Pgyalin, 46, 48, 260.
Phenol, 173.
Phenolphthallin, 236.
Phloroglucine, 72, 241, 242.
Phthisis, stomach, 521, 532.
Phthisis ventriculi, 519.
Physical laws, insufficiency of, to explain problems of life, 557.
Picard, 128.
Pigments, bile, 133.
Pills, intestinal, 154, 155.
Pilocarpin, effect of, on saliva, 50.
Piorry, 270.
Pisenti, 160.
Pitt, 439.
Planer, 103.
Planta, 141.
Plattner's crystallised bile, 131.
Playfair, 644.
Playfair's massage cure, 414.
Plosz, 197.
Pneumatosis, 610.
Podolinsky, 152.
Poehl, 88.
Poisson, 455.
Pokrowsky, 7.
Polyphagia, 616.
Polypi, pedunculated gastric, 331; intestinal, 522.
Polypoid growths, 521.
Pönsgen, 622.
Portal, 344.
Post-mortem action of acids, 208.
Potash, amount of, in the blood, 441.
Potassium, permanganate of, 360.
Potton, 586.
Powder, pancreas, 154, 155.
Powell, 455.
Predisposition to ulcer of stomach, 433; to catarrh of stomach, 490.
Pregnancy, vomiting in, 636.
Pretubercular dyspepsia, 653.
Pribram, 76, 529.
Process of glandular functions, 52; of peptonisation, 86.
Proenzyme, 91.
Prognosis of ulcer of the stomach, 470; of chronic gastritis, 537; of stenosis and strictures of the pylorus, 355.
Projection murmur, 56.
Propepsin, 81.
Propeptone, 83, 255.
Protalbumose, 83.
Proteolysis, 257.
Protrypsin, 152.
Prout, 207.
Ptomaines, 173.
Ptyalism in hysteria, paralysis, &c., 50.
Purgatives, 359, 422, 548.
Purgecz, 327.
Purifying function of the liver, 487.
Purkinje, 144, 147.
Purpura hæmorrhagica, hæmatemesis in, 482.
Purulent inflammation of the stomach, 504.
Putrefaction, intestinal, 173.
Pyloric discharge, 123.
Pylorus, relaxation of, 124, 618; stenosis and strictures of, 318; their course and prognosis, 355; cicatricial stricture of, 329; spasmodic contraction of, 333; forcible digital dilatation of cicatricial stricture of, 362; splitting the stricture, 362; case of cancerous stenosis of, with consecutive dilatation of the stomach, 363; incontinence of, 623.
Pyrmont, 479.
Pyrosis, 513, 525, 609.

Quenu, 650.
Quetsch, 193.
Quincke, 58, 75, 76, 103, 134, 135, 289, 353, 431, 533.

Rabuteau, 248.
Rajewsky, 7.
Rampold, 392.
Ranke, 129.
Ranvier, 35.

Rapidity of absorption, 258.
Raudnitz, 259.
Rayer, 50.
Reaction of gastric juice, 69; of pure peptone, 84; Pettenkofer's, 132; Lieben's iodoform, 246.
Reconversion of peptone into albumen, 197.
Rectum, feeding per, 312.
Reduction phenomena, 9.
Reflex contraction of bile ducts, 129.
Reflexes from other organs, 635; of the intestines, 638.
Regnard, 63.
Regurgitation, 618.
Reichmann, 96, 604, 605, 607.
Relation of burns to ulcer of the stomach or duodenum, 439.
Relation of ingesta to pain, 451.
Relation of syphilis to ulcer of the stomach, 459.
Relations of the digestive fluids to each other, 203.
Relations between the stomach, intestine, and liver, 486; between diseases of the stomach and other diseases, 649.
Relaxation of the pylorus, 124, 618; of the cardia, 618.
Renaut, 35, 36.
Rennet ferment, 81, 259.
Rennet glands, 59; zymogen, 91.
Renvers, 304.
Resorcine, 243, 360.
Respiration, intra-molecular, 20.
Rest, 471.
Reymond (Du Bois), 173.
Reynard, 275.
Richet, 63, 73, 74, 99, 100, 201, 560.
Richter, 345, 596, 631.
Riegel, 233, 347, 394. 395, 396. 401. 437. 438, 604, 606, 607, 627.
Riess, 417, 418, 419, 642.
Rindfleisch, 24.
Riolan, 156.
Rippoldsau, 479.
Risings, nervous. 608.
Ritter, 141, 235. 438.
Roberts. 26, 75, 155, 171.
Robin, 156.
Rodzajewsky, 104, 627.
Röhmann, 83, 138. 171.
Rokitanski, 292, 293. 335. 431, 439, 443, 446. 504.
Rollet, 59. 61.
Roncegno, 643.
Rosenbach. 11, 135, 319, 326, 343, 395. 405. 528, 531, 624, 640.
Rosenberg. 128, 129, 139.
Rosenheim, 71. 91, 113, 231, 235, 395. 400, 437, 533.
Rosenkranz. 568.
Rosenstein. 616.
Rosenthal, 259, 396, 555, 587, 588, 593, 595, 596, 597, 599, 608, 612. 613, 638. 640, 642, 651. 652, 656.
Rosenthal's hunger centre, 556.
Rosin, 63, 230.
Ross, 156.
Rossbach, 67, 608, 626, 627.
Rossier, 620, 622.
Rothschild. 115.
Rubner, 210.
Rudbeck, 196.
Ruff, 112.
Ruge, 176.
Rühle, 652.
Rumination, 618.
Rumsæus, 220.
Runeberg, 269.
Ruppstein, 109, 348.
Rutherford, 129, 549.

Sabourin (Gilles), 448.
Saccharification of starch, 261.
Sachs, 20, 60, 61, 207, 494, 495, 517.
Sahli, 258, 636.
St. Martin, 99.
Salicylate of bismuth, 358.
Salicylic acid, 95, 358.
Saliva, secretion of, 37; composition of. 39, 45; gases in, 39; paralytic, 39; action of, 46, 47, 49; amount of, 49; effect of pilocarpin on, 50; influence of its suppression on the general health. 50.
Salivary glands, 32.
Salivation, 38.
Salkowski, 8. 9. 13. 83, 150, 249.
Salol test, 125; splitting up of, 126: for estimation of motor activity of stomach. 264.
Salomon, 150.
Salt, Carlsbad, 359. 472.
Salts, influence of, 95.
Salvioli, 90, 168.
Saly, 604.
Samuelson, 434.
Sanctuary, 333.
Sandberg, 551. 661.
Sanders-Ezn, 156.
Sanders-Ezn's peptone, 194.
Sanderson (Burdon). 24.
Sarcina ventriculi, 344.
Sarcolactic acid, 70.
Sassezki. 111, 502.
Satiation, theory of, 575.
Saundby, 482.
Sauter, 157.
Sauvage, 622.
Savory, 195.
Scatol, 176.
Schäfer, 187.
Schellhaas. 95.
Scheperlen, 533.

Schetty, 502, 651.
Scheurlen, 193, 371.
Schiff, 81, 92, 93, 106, 129, 138, 160, 167, 430, 431, 538, 559, 573, 625.
Schill, 371.
Schillbach, 274.
Schliep, 228.
Schmidt, 1, 7, 14, 49, 68, 69, 94, 137, 138, 177, 497.
Schmidt-Mulheim, 83, 126, 136, 172, 186, 193, 350, 565.
Schmidtmann, 583.
Schmiedeberg, 8.
Schneider, 393, 619.
Schnetter, 268.
Schofield, 50.
Schrader, 572.
Schreiber, 63, 122, 230, 231, 327.
Schroeder (v.), 8, 23, 99.
Schroth's dry diet system, 357.
Schuchardt, 372.
Schulz, 14.
Schulzen, 109, 139.
Schütz, 66, 67, 95, 123, 222, 269, 335, 615, 625.
Schutzenberger, 18, 149.
Schwalbe, 163.
Schwanda, 134.
Schwann, 23, 137.
Scirrhus, 375.
Scottish douche, 562.
Scurvy, hæmatemesis in, 482.
Seat of secretion in the stomach, 96; of absorption, 193.
Secreting cells, living action of, 51.
Secreting nerve fibres, 43.
Secretion, 560; of saliva, 37; of gastric juice, 231.
Secretion, pancreatic, amount of, 146.
Sedgwick, 442.
Sedillot, 308.
Sée (Germain), 319, 325, 334, 339, 353, 357, 542.
Seeman, 241.
Séglas, 619.
Sehrwald, 97, 105, 106, 107, 434.
Self-digestion of the stomach, 104.
Self-emulsification of fat, 185.
Self-fermentation of yeast, 18.
Senator, 114, 174, 588.
Senn, 160.
Sensibility, 570.
Séré (L. de), 623.
Sewer mud, development of marsh gas in, 109.
Shape of the stomach, 318.
Sheppard, 9.
Sialorrhœa, intermittent, 50.
Sieber, 110.
Siebert, 548.
Sievers, 125, 126, 264, 362, 622.
Siewecke, 414.
Silbermann, 431.
Singer, 72.
Size of the normal stomach, 319.
Sjöqvist, 72, 249.
Skjelderup, 359.
Sleeplessness, 212.
Small intestine, digestion in, 127.
Smirnow, 490, 503.
Smith, 180.
Smith (Meade), 123.
Sohlern, 441.
Solamen hypochondriacum, 549.
Solera, 46.
Soluble constituents of meat, 208.
Solutions, antifermentative, 360.
Somerville, 220.
Sonnenburg, 298, 302, 304, 309.
Sounding the œsophagus, practical hints on, 283.
Spallanzani, 110, 230.
Spee (v.), 183.
Spices, effect of, 96.
Spirits, influence of, 95.
Spiro, 132.
Splitting up of salol, 126.
Spontaneous generation, 23; antiperistalsis, 169.
Stadelmann, 9, 135.
Starch, saccharification of, 261.
Starck, 440.
Stay of the chyme in the stomach, 122.
Stenosis of the cardia, symptoms of, 277; case of, 281; causes of, 287; dyspnœa in, 298; dilatation of, 302; treatment of, 307; cessation of the phenomena of, 392.
Stenosis of the pylorus, 318; course and prognosis of, 355; case of cancerous stenosis of the pylorus with consecutive dilatation of the stomach, 363.
Stevenson, 12.
Stewart (Grainger), 506.
Sticker, 75, 76, 202.
Stiénon, 400.
Stiller, 555, 581, 608, 626.
Stintzig, 60, 493.
Stöhr, 35, 45, 59, 61, 62, 517.
Stolnikow, 160.
Stomach, glands of, 59, 61; movements of, 64, 67; innervation of, 65; nerve-centres in, 66; tube, 74; cancer of, 94, 368; gases of, 103; temperature of empty, 103; absolute temperature of, 104; self-digestion of, 104; micro-organisms in, 108, 439; motor activity of, 126, 262; tube, 219; pump, 225; aspirator, 225; contents of, 234; washing out, 271; electrisation of, 273; massage of, 276, 361; casts of, 318; dilatation of, 318, 320, 354; shape of, 318; size of, 319; mensuration of, 326; ætiology of dilatation of, 327; weakness

in the muscular wall of, 336; loading, 337; abnormal development of gases in, 337; weakness and paralysis of its motor nerves, 338; pathological appearances of dilatation, 339; gastric juice in cases of dilatation, 347; treatment of dilatation, 356; insufficiency of, 343, 367; stomach of the Duc de Chausnes, 344; peristaltic agitation of the stomach, 351; the stomach tube the sovereign remedy in cases of dilatation, 359; faradisation of, 361; tumours of, 392, 405; case of ulcer of, 425; causes of ulcer, 429; predisposition to ulcer, 433; cirrhosis of, 514; anadenia of, 518, 521, 532; phthisis, 521, 532; atony of, 526; cough, 527; relations between the stomach, intestine, and liver, 486; catarrh of, 488; predisposition to catarrh, 490; purulent inflammation, 504; toxic inflammation, 508; neuroses of, 555; causes of neuroses, 579; treatment of neuroses, 638; hyperæsthesia, 582; cramp, 614; atony, 526, 624; internal stomach douche, 640; relation between diseases of the stomach and other diseases, 649.

Stools, fatty, 157; diarrhœic, 177.

Störck, 417.

Storer, 414.

Strassburg, 103.

Strassburg, method of, 133.

Strengthening remedies, 424.

Stricker, 51.

Strictures of the cardiac orifice, 277; causes of, 287; treatment of, 302, 307.

Strictures of the pylorus, 318; cicatricial, 329; course and prognosis of, 355; forcible digital dilatation of, 362; splitting of, 362.

Strumpell, 326.

Strychnine, 359.

Subcutaneous injections of aloine, 359.

Sublingual gland, 44.

Submaxillary glands, 41.

Succussion sounds, 325.

Sugar, digestion of, 114; absorption of, from the stomach, 193.

Sulphur of the bile, 132.

Sundberg, 81.

Suppression of saliva, 50.

Swallowing murmurs, 56.

Swammerdam, 30.

Swelling of the lymph glands, 382.

Swelling theory, 88.

Swiecicki, 97.

Switzer, 304.

Sylvius, 156.

Symonds, 304.

Sympathetic, the, 560.

Symptoms of cancer, 383; intermission of, 388; analysis of, 390; of ulcus ventriculi, 449; of acute gastritis, 496; of chronic gastritis, 523; of gastritis phlegmonosa purulenta, 505; of stenosis of cardia, 277.

Syntonin, 82.

Syphilis, relation of, to ulcer of the stomach, 459.

Syphilitic ulcers, 448.

Szabo, 69, 74.

Tables of gastric digestion, 98, 100.

Tacke, 175.

Talamon-Balzer, 448.

Talma, 525, 607, 642.

Tantini, 569.

Tappeiner, 139, 175, 191.

Tarasp, 553.

Tarschanoff, 182.

Taste of bile, 497.

Taurin, 131.

Taurocholic acid, 132.

Tea, Hamburg, 549.

Te Gempt, 474.

Teleangiectatic cancer, 376.

Temperature of the empty stomach, 103, 104.

Test for lactic acid, 73, 245; for butyric acid, 73, 246; for acetic acid, 246; for alcohol, 247; for free hydrochloric acid, 248; of the motor function of the stomach, 262.

Test meals, 232, 233.

Tetany, 352, 353.

Teuffel, 141.

Thanhoffer, 181.

Therapeutics, Ziemssen's Handbook of, 554.

Thermal springs, 550.

Thiersch, 373, 394.

Thomas, 648.

Thrombi, formation of, 382.

Thudichum, 140.

Tiedemann, 1, 115, 230.

Todd, 582, 583, 604.

Toldt, 59, 60, 62.

Tollens, 88.

Tongue, state of the, 498.

Tormina ventriculi nervosa, 615.

Toxic inflammation of the stomach, 508.

Traube, 21, 338, 451.

Treatment of diarrhœa of children, 170; of stenosis of cardia, 302, 307; of hæmorrhage, 483; of cancer of the stomach, 417; of gastric ulcer, 471; of chronic gastritis, 538; of acute gastritis, 500; of phlegmonous gastritis, 507; of agorophobia, 547; of gastralgia, 547; of neuroses of the stomach, 638; of dilatation of the stomach, 356; of strictures of cardiac orifice, 302, 307.

Trier, 470.

Trinkler, 606.

Tropæolin, 237.
Trophic nerve fibres, 43.
Trousseau, 529, 550, 555, 604.
Trypsin, 148; digestion, 151.
Tschelzoff, 96, 541.
Tubercular ulcers, 448, 459.
Tubes Faucher, 221.
Tubular glands of the intestine, 164.
Tuckwell, 613.
Tuczek, 49.
Tumours, 392, 405.
Tüngel, 377.
Turnbull, 97.
Tympanites, 610.
Tyrosin, 73.

Uffelmann, 74, 93, 99, 111, 114, 122, 206, 239, 244.
Uffelmann's reagent, 245.
Ulcer, gastric, 105; production of, 106, 117; relations of, to cancer, 415; case of ulcus pepticum seu rodens, 425; causes of, 429; in cooks, 433; predisposition to, 433; anæmia in, 435; relation of burns to, 439; micro-organisms in, 439; frequency of, 440; insufficient nourishment as cause, 441; morbid anatomy of, 443; cicatrisation, 447; tubercular, 448; syphilitic, 448; symptoms of ulcus ventriculi, 449; pain, 450; relation of syphilis to ulcer, 459; diagnosis of, 460; prognosis of, 470; treatment of, 471.
Ulceration, diphtheritic, 503.
Ulceration of cancer of the stomach, 382.
Unna, 154, 155.
Urine, alkalinity of, 75; bile acids in, normal, 133.
Urobilin, 134.

Vagus, the, 559.
Valentin, 147.
Valentiner, 134.
Van den Velden, 276, 393, 394, 397, 604, 607.
Van Helmont, 12.
Van Swieten, 169, 372.
Vanillin, 72, 242.
Vaso-motor nerves, 564.
Vassale, 430.
Vegetable aperients, 422, 549.
Vegetables, digestion of, 114, 209.
Vella, 168, 170, 171.
Verneuil, 99.
Vert brillant, 239.
Vertigo gyrosa, 529; a stomacho, 529.
Vesalius, 156.
Vessels, erosion of, 447.
Vichy, 553.
Vidal, 440.
Vignol, 129.
Villi, structure of, 180.
Virchow, 105, 106, 156, 293, 324, 382, 408, 493, 509.
Virchow's hæmatoidin crystals, 134.
Vizioli, 640.
Vogel, 133, 417.
Voit, 74, 114, 137, 190, 194, 195.
Voltmer's mother's milk, 156; peptonised milk, 422.
Vomit, coffee grounds, 385.
Vomiting, 390, 451, 568; fæcal, 392; nervous (vomitus nervosus), 610; in pregnancy, 636.

Wagner, 323.
Waldeyer, 33, 373, 374, 375.
Walshe, 372.
Walter, 127.
Walther, 190.
Wasbutzki, 174.
Washing out the stomach, 271.
Waters, *see* Carlsbad, Kissingen, &c.
Watney, 33, 181.
Watson, 482.
Wawrinsky, 93.
Weakness in the muscular wall of the stomach, 336; of the motor nerves of the stomach, 338.
Wegscheider, 176, 207.
Weinmann, 46.
Weiss, 139, 220.
Weissgerber, 608, 609.
Welch, 368, 369, 377, 382, 483.
Werner, 346, 655.
Westphal, 529.
Westphalen, 129, 130.
Wiederhofer, 343, 532.
Wiesbaden, 96, 553.
Wiesner, 228.
Wilkens, 605.
Wilkinson, 368.
Wilks, 439.
Will, 189.
Williams, 177, 449.
Willigk, 470.
Wilson, 109, 482.
Windthier, 620.
Wine, influence of, 95.
Winkhaus, 354.
Winter, 250.
Winternitz, 362.
Wistinghausen (v.), 186.
Witosowski, 444, 445.
Witte, 453.
Wittich (v.), 80, 129, 131.
Wolff, 193, 263, 359, 661.
Wolf-hunger, 585.
Wolfram, 396.
Wood charcoal, irrational use of, 547.
Wright, 45, 50.
Wurzburg, 369.
Wyman, 23.

Yeast, self-fermentation of, 18.
Yellow atrophy, acute, 481.
Yellow fever, hæmatemesis in, 482.
Yellowly, 481.
Yeo (Burney), 656.

Zabladowski, 361.
Zawarykin, 187.
Zawilsky, 184, 192, 208, 209.
Zeckendorf, 624.
Zenker, 56, 57, 58, 134, 278.
Zesas, 308.
Ziegler, 504.
Ziehl, 157.
Ziemssen (v.), 228, 268, 275, 276, 278, 318, 464, 471.
Ziemssen, Handbook of General Therapeutics, 554.
Zuntz, 175.
Zweifel, 39, 50, 147, 193.
Zymogens, 17, 91, 152.

LONDON:
Printed by Jas. Truscott & Son,
Suffolk Lane, City.

R
702
E83
v.2
1992
LANE
HIST

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on
or before the date last stamped below.